COAL AGE

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ARE you feeling rather tired and out of sorts just now? Sure! You're suffering from "Spring Fever"!

There is only one class of human beings who escape the tired feeling incident to Springtime—the poets: For them this is a season of undue activity.

If you assume that every one regrets the advent of Spring, just shadow the trail that leads to the fishing pool, and you'll go home convinced that your wits have been woolgathering. It doesn't take the boys long to discover that the outside boss isn't keeping close tab on them, while the fever keeps hold of him, and they slip off satisfied that they won't be missed.

Isn't it just barely possible that these same boys are the only ones around the camp who have found a sensible remedy for the annual tired feeling—sneak away and commune with nature while she is at her best and you are at your worst?

We wonder what would happen if every mining company should set apart one day each Spring and allow the entire camp to shut up shop and take to the woods—women, men, children, babies, dogs, mules, etc.,—that they might enjoy together a genuine old-fashioned picnic.

Think of the ideal picnic grounds that are within easy riding distance of most camps: Water, flowers, moss, trees, birds; with such a combination you can stage any kind of outdoor fun from baseball to "spooning."

Mining folk in this country display little imagination when it comes to planning amusements and recreation for themselves and their families, which explains, no doubt, their lack of community interest.

Can you picture to yourself anything better calculated to develop a community spirit than an entire camp's population being hauled to a picnic in company wagons, drawn by company mules, under the personal direction of the local superintendent, at a time when the Spring fever is first making itself felt?

Such a picnic holds out many possibilities. If all the women folk are required to furnish eatables for a general feast, good-natured discussions as to culinary usage will spring up and the rivalry promoted will have its effect on many a future bill of fare—if you consider all miners' wives ideal cooks, your digestive organs must resemble those of the proverbial can-eating billygoat.

Furthermore, think of the misunderstandings that might be cleared up during a general gathering of this kind. Isn't it reasonable to suppose that many a strike could have been avoided if opportunity had been presented to talk things over in a friendly way, spontaneously?

"All work and no play—"

Honest now! has the miners' play been given proper consideration?

A Brief Account of the Matanuska Field

By W. R. Crane*

SYNOPSIS—The Matanuska field has been exposed to less violence and volcanic heat than the Bering River field. Some of the coal is almost lignitic, but 75 per cent. is bituminous fuel. The best coal chemically is in the worst physical condition and would have to be briquetted or coked to make it acceptable to the market. A portion of the field has good coal, which could be mined at reasonable expense.

The Matanuska coal region, as commonly defined, occupies an area some 80 miles long by 5 to 10 miles wide, lying principally along the valley of the Matanuska River and extending to the eastward from a point slightly to the northeast of Knik, on Knik Arm.

The coal-bearing area is being rapidly extended until at present a considerably larger area is included in the field than was at first anticipated. Coal is now known to occur in beds of workable size to the northward along the Susitna and the Little Susitna rivers and on Willow, Caribou and Billy creeks, while to the southward similar

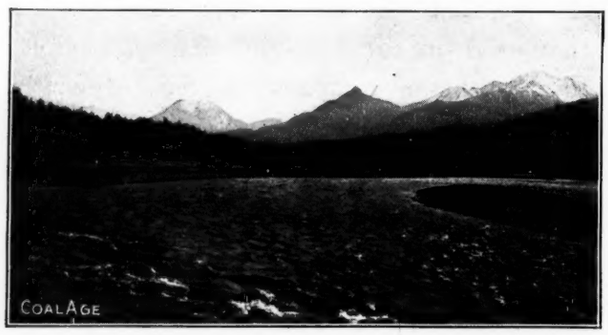

Fig. 1. Looking up Matanuska River, Chugach Mountains in Background

beds have been located at various points, covering considerable areas in the Chugach Mountains.

The Topography of the Field

The wide valley of the Matanuska River lies between the Talkeetna Mountains on the north and the Chugach Mountains no the south, both of which ranges are steep and rugged, having elevations ranging from 3000 to 6000 ft. See Fig. 1.

The country to the north of Knik Arm consists of lowlands, which gradually increase in elevation as the valley of the Matanuska River is approached and change into a comparatively narrow strip of rolling country with hills seldom exceeding 1500 ft., but increasing rather abruptly in height as the main ranges of the mountains are approached.

Unlike the Bering River coal field, this region is not isolated from the interior by mountains and glaciers, although to the northeast and eastward, except for a few passes, the passage to and from the region is rather difficult. However, to the northwest and westward, a continuous stretch of practically level country extends along Knik Arm and thence into a similar country adjacent to Cook Inlet. The accompanying map gives the location of the rivers and creeks in the coal field with respect to Knik Arm. See Fig. 3.

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Not an Icy Wilderness but a Productive Valley

Few parts of Alaska excel the valley of the Matanuska River in favorable climatic conditions. The rainfall is abundant but not excessive, and the amount of sunshine

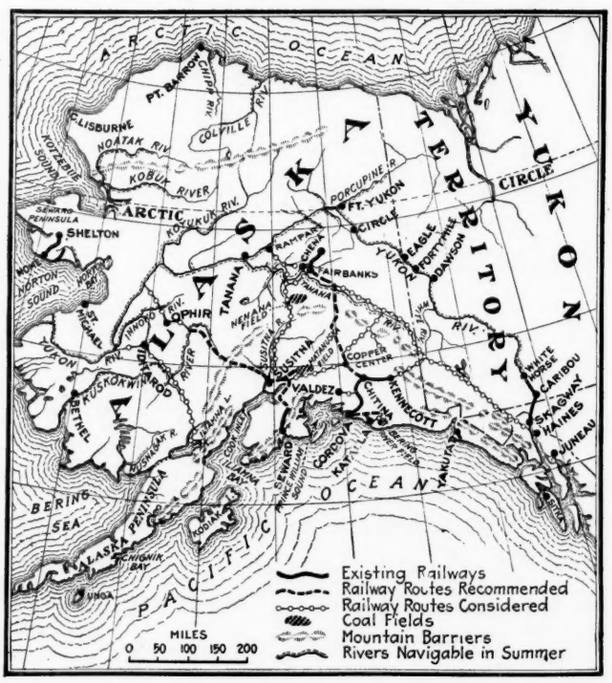


Fig. 2. The Alaska Coal Fields and the Railroads Built and Proposed

is sufficient to insure the growth and maturity of vegetation, as the luxuriant growths on the flats bordering on Knik Arm and the valley of the Matanuska attest.

Excellent pasturage for animals and a soil suitable for raising a great variety of vegetables and cereals is to be found in this locality. In the valley of the Matanuska, timber grows in great variety. The most common trees, naming them in order of their frequency, are the following: Cottonwood, birch, spruce, quaking aspen, white willow and alder; current bushes are also abundant.

The width of the bed of the Matnuska River probably averages one-half mile, although it measures a mile or more in some places. The stream gorges with precipitous walls at other points. It often consists of extensive flats of gravel and sand, through which swift mountain torrents and glacial streams are constantly cutting new channels. See Fig. 1.

No Lack of Rivers and Creeks

The principal streams tributary to the Matanuska River and entering it on the north are: Moose, Eska, Granite, Kings, Chickaloon, Hicks and Caribou, while on the south and proceeding up the river in the same order as before are: Carbon and Coal and numerous others of minor importance. These tributary streams are usually of con-

siderable volume and are, particularly in certain seasons, difficult to ford.

While the Matanuska River can be forded in a number of places, crossing it is usually a hazardous undertaking. Owing to the difficulties encountered in towing and poling river boats up the river, most of the supplies required in the field are either carried in by pack animals or are sledded in during the winter, the trail following the course of the river.

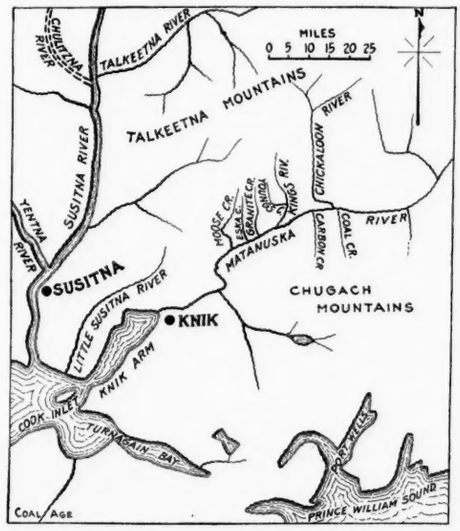


FIG. 3. THE IMMEDIATE SURROUNDINGS OF THE MATANUSKA FIELD

is estimated that some 70 square miles are underlaid with coal. Of this area fully three-quarters, or approximately 50 square miles, contain coal of a bituminous character.

The coal areas of this field are naturally named after the various streams where coal has been found to outcrop. These streams are all tributary to the Matanuska River. The only exception is the anthracite ridge, which lies between two streams. For convenience in discussion the coals of the bituminous area can, therefore, be separated into districts according to the arrangement indicated above, namely, those along Chickaloon, Kings, Young, Eska, Moose, Carbon and Coal creeks, respectively. The last two mentioned, the combined Carbon and Coal Creeks district, lies to the south of the Matanuska and on the opposite side of the river to the Chickaloon Creek district.

THE NORTHEASTERN AND SOUTHWESTERN GROUPS

This subdivision of the bituminous area by districts does not take into consideration the character of the coal, which, if followed, would require a wholly different arrangement of the districts in the field. Were the bituminous areas to be subdivided according to character of coals, the coals on Chickaloon, Carbon, Coal and Kings creeks would be placed in one group and called true bituminous coal, while the coals of Young, Eska and Moose creeks would be designated as low-grade bituminous fuels, as they are in some places considered lignitic in character.

The general physical appearance of the coals of Chickaloon and Kings creeks, when compared with those in the southwestern portion of the Matanuska coal field, would seem to indicate that there should be a greater difference in chemical properties than there actually is.

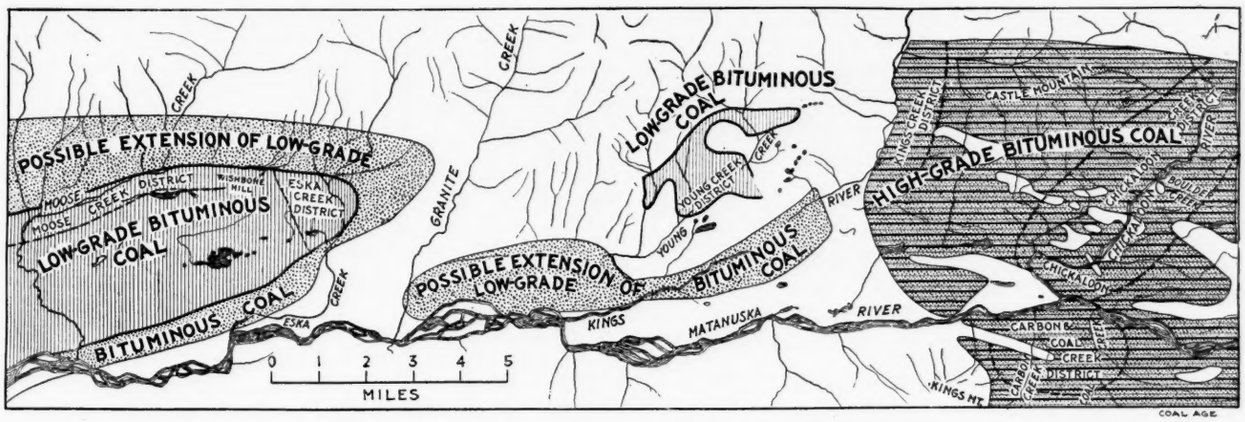


FIG. 4. MAP SHOWING THE VARIOUS COAL DISTRICTS

It is claimed that George Jammé discovered the coal in this field at a comparatively early date, although it was not until 1894 that it became generally known that coal occurred in workable quantities. While considerable work has been done in certain localities, it has been confined to exploratory work and since the withdrawal of the coal lands from entry the field has been practically abandoned.

COAL IS OF VARIED GRADES

The area in which the various grades of bituminous coals occur, extends up the river as far as Chickaloon Creek, including particularly the region lying between and including Moose and Chickaloon creeks. Of the 300 square miles of coal-bearing formations in this field, it

Further, the rock movements evidenced by the folds, faults and igneous intrusions apparent in the upper coal field, gave every opportunity to the coals of both Chickaloon and Kings creeks and possibly to less extent Carbon and Coal creeks to assume a radically different character from those of Young, Eska and Moose creeks, where the rock movements appear to have been slight compared with those in the districts above mentioned.

THE CHARACTERS OF THE COALS

The physical condition of the coals of the bituminous area of the Matanuska field is, as a whole, good. The coals of Chickaloon Creek and Kings Creek districts are exceptions. These are badly broken and fractured and much fine coal will be produced in their mining and hand-

ling. The rock movements responsible for the broken condition of the coals on Chickaloon and Kings creeks were much less severe in the western portion of the field, for aside from a moderate degree of folding and faulting the coal remains practically undisturbed.

The U. S. Geological Survey has made extensive tests, both chemically and physically, on the coals of this field. The results of some of these tests are given in the following table[1]:

ANALYSES OF MATANUSKA COALS

District	Total Moisture	Volatile Matter	Fixed Carbon	Ash	Sulphur	Calories	B.t.u.	Fuel Ratio
Chickaloon Creek....	1.98	17.20	66.08	14.56	0.67	8260	14,868	3.77
Carbon and Coal Creeks.....	4.20	19.72	65.26	10.82	0.42	6649	11,968	3.32
Kings Creek.....	1.45	22.77	66.40	9.38	0.67	7419	13,354	2.91
Youngs Creek.....	2.50	28.32	58.82	10.36	0.58	..	.....	2.08
Eska Creek.....	6.08	35.41	49.78	8.23	0.42	6299	11,338	1.41
Moose Creek.....	7.04	35.45	49.10	8.41	0.32	..	....	1.39

The chemical properties of coals determine their value and utilization while the physical properties indicate the possibility of their production and are limiting factors in their utilization. It is not, therefore, easy to say which may be the most important from the commercial standpoint, except that the first consideration is fuel value.

The Relative Availabilities of the Coals

The coals of Chickaloon Creek, Carbon and Coal Creeks, and Kings Creek districts, being in bad condition for use commercially, and readily making a coke of good quality, are naturally best suited for the production of coke. But, like the Bering River coals, they might be briquetted to advantage.

The coals of the remaining districts being hard and firm, could be mined with the production of a moderate amount of small coal, thus permitting them to be placed on the market in competition with coals of other fields. Further, the conditions under which these coals occur are no more severe nor extreme than the conditions existing in other localities, where mining is carried on both extensively and economically.

Much depends upon means of transportation both by rail and by water, if these coals are to be placed on the market in competition with other coals. However, Alaska needs fuel for local consumption, and with the assurance that a reasonably cheap fuel can be obtained, the consumption will steadily increase to the vast benefit and growth of her various industries.

[1]U. S. G. S., Bull. No. 289, pp. 27 and 28.

How Electricity May Make Mines Safer

H. H. Clark, electrical engineer of the Bureau of Mines, in his paper on "Safeguarding the Use of Electricity in Mines" read before the Pittsburgh meeting of the American Institute of Electrical Engineers which met Apr. 18 and 19, made the following remarks relative to the hope that mines will be safer when certain electrical developments become more general and are modified to meet the needs of the situation.

"There are, however, some ways in which it seems possible for electricity to decrease the risks now attendant upon mining work. There is one piece of electrical equipment which may almost be considered as a safety device and there are three others which, by substitution for more dangerous equipment and methods, promote the safety of underground workers.

"First may be mentioned the telephone, which is of use in spreading the news of trouble, in calling aid to the injured, and in assisting in mine-rescue work after disasters. Next may be mentioned portable-electric lamps for use of miners. The development of such lamps is just beginning in the United States. At the date of this writing no device has been fully developed and standardized for insuring absolute freedom from gas ignition by lamps of this sort.

There can be no doubt, however, that in the near future some such device will be developed and then the electric lamp will become safer than the locked safety lamp, although it has not the latter's ability to detect the presence of explosive gas. The statement that the electric lamp may be made safer than the safety lamp is based upon the fact that the parts of a safety lamp may be improperly arranged and ignition of gas occur as the result. The records show that this has happened on more than one occasion.

"The greatest benefits to be derived from the electric lamp as a safety device will be in those mines where the electric lamp supplants the open-flame lamp and thereby eliminates a real fire hazard.

"Next may be mentioned the firing of shots by electrical means. There can be no doubt that the firing of shots by properly designed and operated electrical shot-firing devices and equipment is safer than firing them by fuses or other devices which ignite explosives by means of sparks or flames.

Use of Storage-Battery Locomotives

"Finally, it may be suggested that electrical development may partially remove some of the greatest dangers now confronted, by displacing trolley locomotives for those actuated by storage batteries. Main-line haulage by such locomotives can hardly be advocated at present but the gathering of coal by these motors seems to be a feasible proposition, in many cases.

"The use of storage-battery locomotives would entirely do away with the trolley wire from a large part of the mine entries which are now provided with this dangerous equipment. In addition to the greater degree of safety assured, storage-battery locomotives would be more flexible to operate than are cable-reel motors. The load factor on the generating station would be materially improved, satisfactory voltage regulation of the distributing system could be obtained with less copper, and the expense of installing and maintaining trolley wire and rail bonding would be eliminated in the entries worked by storage-battery locomotives."

He also made the following observations regarding the premature ignition of shots:

"It is not the best practice to shoot electrically under conditions that require one side of the detonating circuit to be connected to the earth, because wherever grounded systems of distribution are used unexpected differences of potential exist in the earth in the vicinity of such circuits. If, therefore, one side of the detonator be purposely grounded, an accidental ground on the other side of the detonator may enable an igniting current to traverse the detonator. Premature ignitions have been reported which seemingly have been caused by the conditions just described."

Parallel Operation of Alternators

By C. A. Tupper*

SYNOPSIS—Conditions are here enumerated, which must be complied with before two alternators may be placed at work in parallel upon a common load.

With the rapidly increasing use of electric power for coal mining, its generation and distribution as alternating current has become general; hence the matter of operating various units of a large system or systems in parallel has assumed an importance, at many plants, formerly unknown.

This is particularly true where all of the alternators are not in the same power house, serving a single mine or group of mines, but are installed in stations located at different points in an extensive area and connected by a common net-work of transmission cables.

Such interconnected systems have heretofore been more common in Europe than in America; but within a few years that condition is likely to be reversed. A discussion of the various factors to be considered in operating such units may, therefore, be of value.

When alternating-current generators are run in parallel, there are certain conditions that must be met in order to secure satisfactory operation. These are:

(a) The machines must be in synchronism. That is, the frequency of alternation must be the same for each, and the points of maximum potential of the different units must be in phase.

(b) The voltages must be approximately equal.

(c) In order to secure proper division of the load under changes in load conditions the speed regulation of the prime movers must be alike.

(d) To prevent periodic cross-currents between machines the variations in angular velocity during different parts of the revolution of the prime movers must be kept within certain limits. In waterwheel or steam-turbine-driven units the angular velocity is uniform, but with reciprocating-engine-driven generators there may be trouble, due to periodic variations in angular velocity, if the engine flywheels are not sufficiently heavy.

With belted alternators it is important that the pulleys be proportioned so as to make the speeds of the generators such that they will give exactly the same frequency; if all the machines have the same number of poles their speeds must be exactly alike. If the pulleys are not of the proper size there will be excessive belt slippage or exchange of cross-currents between the various units, thus causing fluctuations in voltage.

With engine- or steam-turbine-driven alternators the speed can be varied by adjusting the governor, and there will be no trouble from cross-currents provided the angular velocity of the engines does not vary too much, and the engine governors act properly.

When alternators are running in parallel their output (actual power) depends on the amount of power supplied by their prime movers. For example, suppose two engine- or steam-turbine-driven machines are running in parallel and that each is taking half of the total load. When the load increases there is a tendency for the speed to drop slightly, and in order for the engine governors to act and admit more steam there must be such a speed decrease.

Now the two alternators must always run in synchronism, or at the same rate, assuming the number of poles to be alike, and if the drop in speed does not result in an equal increase in the steam admission of each engine, one alternator will be supplied with more power than the other and the load will become unequally divided.

Changing the field excitation of the lightly loaded machine will not remedy matters (as with direct-current generators where the machines do not have to run in synchronism and have independent speeds). The only effect of changing the field excitation is to make a wattless current circulate between the two alternators, the actual amount of power supplied by each remaining the same.

The only way to increase the steam admission is by adjusting the engine governor, and to secure equal division of load under all conditions, the change in speed for a given change in load must be alike for each engine. When two or more alternators are run in parallel it is advisable to have an indicating wattmeter on each machine, so that the actual load will be indicated.

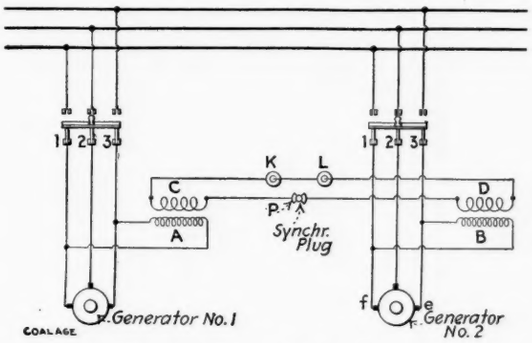


Fig. 1. Diagram for Synchronizing Two Alternators

In case wattmeters are not provided the load on each should be adjusted so that the sum of the currents as indicated by the machine ammeters will be a minimum for a given total current supplied to the line. If the sum of the machine currents is much in excess of the line current it shows that a wattless current is circulating between the machines.

Testing for Synchronizing

The condition of synchronism is usually indicated either by incandescent lamps, which is the simplest method, or by a synchronism indicator or synchroscope, the latter now being used in most large installations. A synchroscope gives more accurate indications than lamps and has the additional advantages of showing whether the incoming machine is approaching or receding from phase and how much this variation actually is.

Fig. 1 is a diagram of the connection for synchronizing lamps. Two small transformers *A* and *B* have their primaries connected to the same phase of each generator. The secondaries *C* and *D* are connected in series through plug or switch *p*, to the lamps *K* and *L*. Assuming that cor-

*Milwaukee, Wis.

responding terminals of the primaries are connected to corresponding lines on each machine and that the two transformers are alike in every particular, corresponding secondary terminals will, at any given instant, have the same polarity when the two machines are in phase. When plug p is inserted, secondary terminals of opposite polarity are connected together; hence the two secondary voltages are in series and aid each other in forcing current through the lamps K and L, which are, therefore, bright at synchronism.

It may happen that the transformers are not wound exactly alike or that the connections have become confused; it is always advisable, therefore, to test them out to make sure that the lamps are light or dark at synchronism. To test the connections in Fig. 1, disconnect B from generator No. 2 and transfer the connections, without changing their relative position, to lines 1 and 3 of generator No. 1; A and B will then be connected to the same lines and if the lamps are bright, they will also

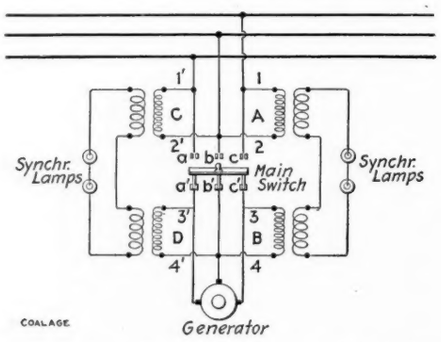


FIG. 2. TEST FOR PROPER CONNECTION TO BUSBARS

be bright at synchronism when B is connected to generator No. 2, as shown. If dark lamps are preferred, either the primary or secondary connections of one transformer must be reversed.

Another method of testing is to leave the transformer connections as they are and disconnect the main leads at e and f on generator No. 2. Both main generator switches are then closed, thus connecting both transformers A and B to generator No. 1. In synchronizing, bright lamps are to be preferred to dark.

When a polyphase alternator is first connected up it is highly important to see that all of its phases correspond with those of the busbars; if one phase only of a three-phase machine is correct, it does not follow that the other two are correct also. Two of the phases should be tested at the same time by using a pair of auxiliary transformers in addition to the regular synchronizing transformers A and B, Fig. 2. Transformer A is connected to the busbars and B to the generator. A second pair of transformers C and D is connected to one of the other phases, the connections in each case being such that the lamps are bright at synchronism.

The connections should be tested as described above to make sure that the polarity of the transformers is correct. With the main switch open and with the generator running at full voltage, both sets of synchronizing lamps should pulsate together. If they do not do so the generator leads are incorrectly connected to the machine terminals and should be interchanged so as to make the lamps pulsate together. After this test has been made, to insure that terminals a, b, c connected to the busbars correspond to a', b', c', connected to the generator, the temporary transformers C and D can be removed.

Bring each alternator and exciter up to speed and make sure that the oil rings are revolving freely. See that all resistance in both exciter- and alternator-field rheostats is out and that both field and main switches are open. Cut out resistance in exciter field and bring the exciter pressure up to normal. Close the field switch of the alternator and have all resistance in so that full voltage will not be generated in the windings.

In case the machine is being started for the first time, allow it to run for an hour or two at low voltage and then gradually increase the voltage until it reaches normal; the load can then be thrown on. As the load increases it will be necessary to cut out some resistance in the field circuit in order that full voltage may be maintained, and if the load on the alternator is inductive a larger amount of resistance must be thus removed than with noninductive load.

On light loads comparatively small field excitation is required and it is advisable to run the exciter at rather low voltage and avoid wasting so much power in the field rheostat, provided the exciter voltage is not made low enough to render the operation unstable or cause sparking at the brushes, and that the exciter is not supplying current to other alternators.

A New Expansion Bend

The proper provision for expansion and contraction of steam pipelines is a subject which should receive the most careful attention in any piping layout. This is particularly true, however, when high pressure and superheat are to be dealt with. At 175 lb. pressure a superheat of 375 deg. F., causes an expansion of the pipe 2.2 times greater than is the case when saturated steam is used at the same pressure.

One of the most satisfactory expansion bends which has heretofore been produced is what is frequently termed "the lyre shape" which is equivalent to a double-offset U-bend combined with two 90° bends. The principal objection to this shape is, however, the great space which it requires, particularly in the larger sizes of pipe.

THE NEW BEND; NOTE SECTION

In order to obviate its great size and lessen the strain due to excessive expansion and contraction, a German firm has recently brought out a flat "lyre" shaped bend, the cross-section of which is somewhat elliptical in form and resembles, to a considerable extent, the ordinary Borden tube as used in the steam gage. The manufacturers of this new expansion bend claim that its compensating capacity is four times as great as that of the ordinary bend.

According to the U. S. Geological Survey, more recovery coke plants were constructed in 1909 and 1910 than at any time since 1903. In 1909, 649 such ovens were being built and 800 more were contracted for. Of the 649 ovens in process of construction in 1909, 99 were finished and working in 1910. The amount of coke produced by byproduct ovens in 1910 was 7,138,734 short tons, against 6,254,644 tons in 1909, an increase of 14.13 per cent. The output of byproduct coke ovens in 1910 was 17.12 per cent. of the total coke production. The average cost of coal used in the byproduct ovens in 1910, $2.18 per ton; the cost of that used in beehive ovens was $1.01.

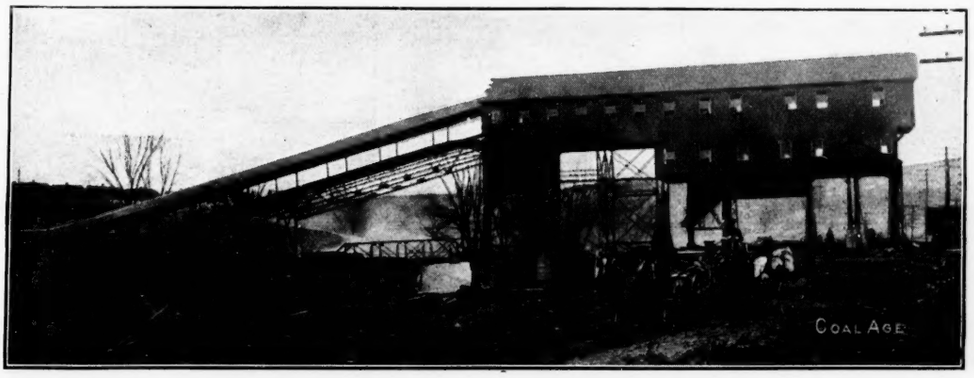
The Car Hauls for a Modern Tipple

By F. R. Bogart*

SYNOPSIS—A system of six hauls which disintegrates a trip at the foot of the tipple incline, elevates one car at a time, five cars per minute, lowers the cars at the same speed and makes them up into trips of empties again.

In order to rapidly handle the output of the No. 2 colliery of the Provident Coal Co., at Fairpoint, Ohio, a system of chain car hauls was recently installed. At this plant the mine cars weigh 6000 lb. when loaded and 2000 lb. empty. These are hauled up an incline at the rate of five per minute. The incline is approximately 200 ft. long and the difference in elevation between the ground level and the tipple floor is about 47 ft. The angle of inclination is thus slightly over 14°.

There are three headings into the mine, one for the exit of loaded mine cars, and the other two for the entry of empties. The latter lie upon either side of the former, and the tipple floor is provided with four tracks.



Tipple and Incline up Which Cars Travel

The system consists of a feeder-haul 20 ft. long, center to center of shafts, for loaded cars at the foot of the incline; an up-haul for loaded cars 225 ft., center to center; two down-hauls for empties, each 205 ft., center to center; and two trip-maker hauls, each 20 ft., centers at the foot of the down-hauls.

A mine locomotive brings a trip of, say, 50 loaded cars, and drops them where the first car can be picked up by the hooks of the loaded car feeder. This feeder is controlled by an attendant who operates the friction clutch, starting or stopping the haul. Starting the haul, advances the trip till the second car in the train is engaged by a hook of the feeder. The chain is then stopped long enough to pull the coupling pin between the first and the second cars, whereupon it is restarted, the following car pushing the uncoupled one upon the foot of the up-haul, where it is caught by the haul hooks and drawn up the incline.

After passing over the tipple dumps, the empty cars are delivered by gravity from kickbacks to the head of the down-haul. Here they encounter a slight incline upward, just before they reach the top of which they are caught and held by one of a series of dogs until they are automatically picked up by the hooks of the down-hauls, which pull them up and over a hump, and then lower them down the incline, to be released automatically at the foot, ready for assembling into trips by the trip-maker haul.

The two trip-makers and the feeder-haul are driven from one lineshaft operated by a 35-hp. motor, and each can be operated independently of the others by friction clutches. Driven from the head of the feeder-haul, and arranged to be thrown in by a clutch, is installed a car puller, to bring up a trip of cars which may have been dropped by the locomotive some distance from the feeder.

The driving machinery of the trip-makers is arranged with a breaking-pin device to give way and protect the machinery in case a "wild" locomotive bumps into the trip while it is being pushed by these trip-makers. The two down-hauls and the up-haul are connected by shafting and gearing, and are operated by one 75-hp. motor. Clutches are also employed to allow either of the down-hauls to be thrown out.

Upon one of the countershafts of the up-haul there is arranged an automatic band brake, which prevents the chain from running backward in case the current should be cut off while there are cars upon the incline.

The chain for the up-haul is composed of 18-in. pitch upset-end links with wrought-steel rigid hooks every 18 ft. upon four-roller trucks, and two-roller trucks placed midway between hooks to better support the chain. The rollers are flanged, 6 in. in diameter, and of the inclosed-oiling type.

The chains on the down-hauls are of 12-in. pitch with flat links, and with double-tumbling hooks of cast steel every 18 ft. These are also provided with four-roller trucks, and with two-roller trucks placed between. The rollers are identical with those above mentioned.

The chains for the feeders and trip-makers are 12-in. pitch links with cast-steel one-way tumbling hooks every 10 ft., provided with four-roller trucks. The rollers in this case are, however, 4 in. in diameter, but are inclosed oiling, similar to the others.

George A. Baton Co., of Pittsburgh, were the engineers for the tipple, which was erected by William B. Scaife & Sons' Co., of Pittsburgh. The car-hauls were designed and installed by the Link Belt Co., of Philadelphia.

*Engineer, Link-Belt Co., Philadelphia.

Guideless Mine Accumulator Locomotives

By J. Rechtenwald

SYNOPSIS—Description of a novel haulage system which dispenses with the services of the motorman. Comparatively low speed is used and provision is made for automatically stopping the motor when obstructions are encountered, and also for throwing the required switches. The method certainly has its limitations, and there appear to be many possibilities for failure, but there are undoubtedly numerous cases where it might be economically applied.

In the von der Heydt mine, some time ago, a hauling system with accumulator locomotives and without motormen, was installed. The construction of the locomotives in general is not greatly different from the usual accumulator locomotive, only the motorman is replaced by a device which, on meeting an obstacle, automatically disconnects the electric current, pulls the brakes electromagnetically and stops the train at once; the same device releases the brake, and switches on the current as soon as the obstacle is removed and the road again clear.

The construction and action of the arrangement is shown in Figs. 1 and 2. The feeler-like wooden frame, which protrudes over the fore part of the engine, is attached in sled-like fashion to the body of the locomotive so that when meeting an obstacle it can retreat until behind the bumper of the engine. When the wooden frame is thus pushed back, the electric current is disconnected by a switch and at the same time a short circuit is produced which sets a powerful brake on the wheels. This action occurs even if the loop is pushed back a little distance only.

The slow speed of one meter per second is used so a short application of the brake is sufficient to avoid any collision; it has been found that the motor, with a full load behind, stops readily after one meter of travel. By pushing back the protruding frame, a spring is pressed together which advances again as soon as the pressure is relieved; this at the same time switches on the current. The action of the spring is regulated by an oil buffer, so that the switching on of the motor occurs gradually; the disconnecting, however, occurs suddenly. The hoop, in its sled-like guide, is arranged so that it can be swung over the top of the battery to the other side of the

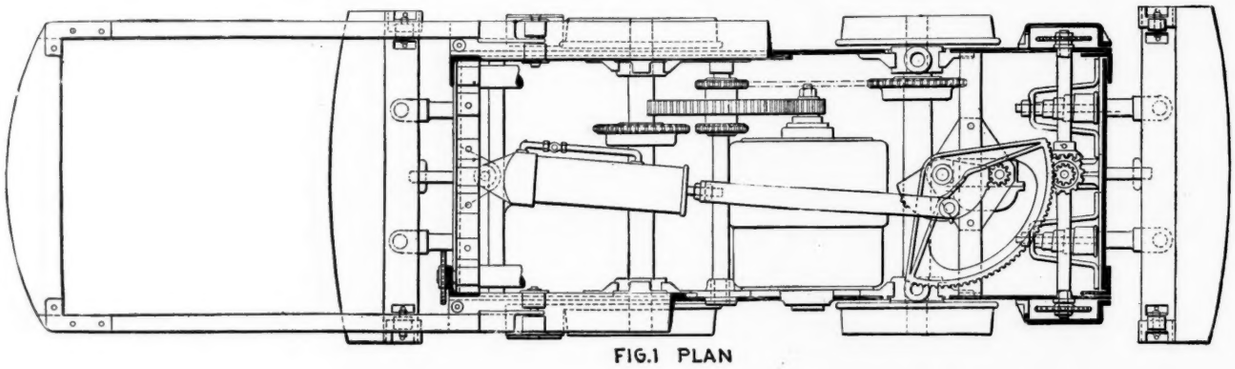


FIG.1 PLAN

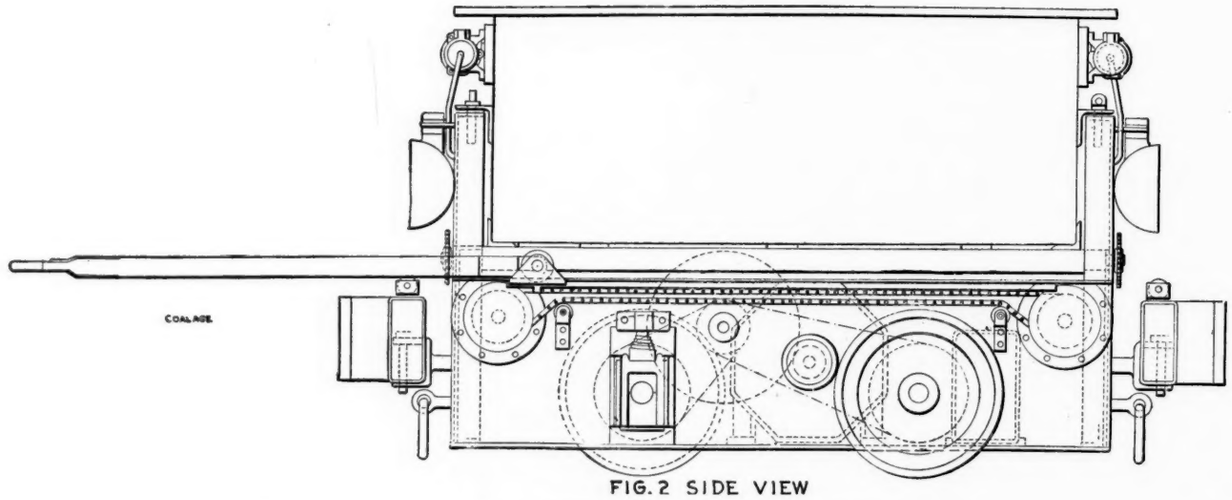


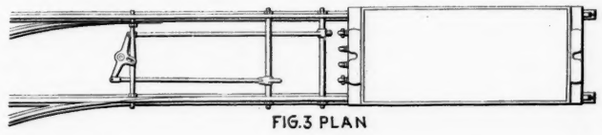
FIG. 2 SIDE VIEW

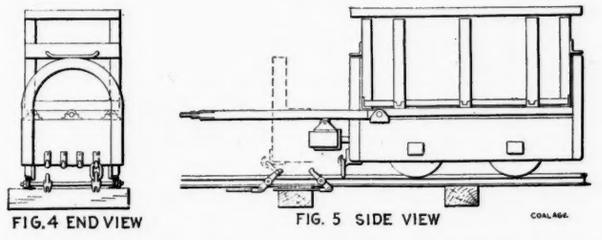
Figs. 1 and 2. Plan and Elevation of Guideless Mine Motor

Note—Translated from "Glückauf."

locomotive, and thus give it another direction of travel, if so desired.

The device is so sensitively constructed that a minimum pressure against the frame, for instance, running against a miner, brings the train to a sudden stop. Also if the obstacle should exert a pressure in a slanting direction, as for instance, when crossing switches or curves, the frame is easily pushed back by a parallel guide running in a chain and rolls. (See Fig. 1.) Thus any laborer, without special knowledge, can stop the locomotive immediately or give it another direction of travel. If it is to be stopped altogether, the frame has only to be pushed back and held in this position by a bolt.





FIGS. 3 TO 5. AUTOMATIC SWITCHING ARRANGEMENT

The power is furnished by a side-circuit motor of two horsepower, which acts upon the axles through a double gear. (See Fig. 2.) Going down inclines this kind of motor keeps up the same number of revolutions and when miners are carried to their places or back to the foot of the shaft, a higher speed can be used; these advantages could not be obtained with a main-circuit motor.

The batteries are charged by a current of 220 volts, which is developed outside the shaft. Each battery consists of 30 cells, of 2-volt discharge tension, with a capacity of 72-amp.-hr. and a radius of action of 10 km. The discharge tension of the battery is 60 volts and it is charged with a current of 30 amp. by connecting the battery to a plug with direct current. The time required for charging is three hours and the exchange of the batteries can be made by one man in two to three minutes. The weight of the locomotive, ready for use, is 2.5 gross tons. The measurements are as follows: Length, 8 ft. 5 in., without frame; breadth, 2 ft. 11 in.; height, 4 ft. These dimensions were selected so that the locomotive could be used wherever horses were working.

SWITCHING ARRANGEMENT

The switches, which ordinarily have to be thrown by hand, are so arranged that the locomotive changes them automatically. The front end of the locomotive shows various hooks (see Fig. 4), on which rings are hung that engage levers, laying between the tracks which, in turn throw the switches; the different hooks are so arranged that they are exactly above the levers of the corresponding switches. Before starting the train, rings are placed on the front which will throw the switches for the track it desired the trip shall take. The switch tongues themselves are retained in the final position by springs, and when leaving the switch, are pushed into the right position by the wheels of the locomotive. The mine doors are opened in both directions, automatically by the locomotive itself, without the frame touching the door (see Fig. 6). At both sides of the door, next to the rail, are swinging posts, at bumper heights, and so fastened that when the door is closed they are directly across the rails. As soon as the bumper of the locomotive pushes the post sideways (see dotted line) the door is either pulled or pushed open by a rigid-lever transmission. After the train has passed and the door shuts itself.

There are also block stations, which prevents trains at the junction of two lines or at a crossing from running into each other. To stop one of the trains a post is fastened at the height of the frame; this is held by a blocking device with a rope and spring transmission. As soon as another train passes the switch, the post is pushed aside, and when it has left the switch, the blocking device is released, the frame of the locomotive then advancing and thus switching on the current. The various locomotives succeed each other at suitable distances, thus furnishing a continual supply of coal. The locomotive following is always stopped by the last car of the leading train and advances automatically as soon as the latter releases the frame of the second locomotive. Each of the two locomotives, in eight-hour shifts, does about 65-ton-km. of work, with a current consumption of 0.167 kw.-hr. to 1 ton-kilometer.

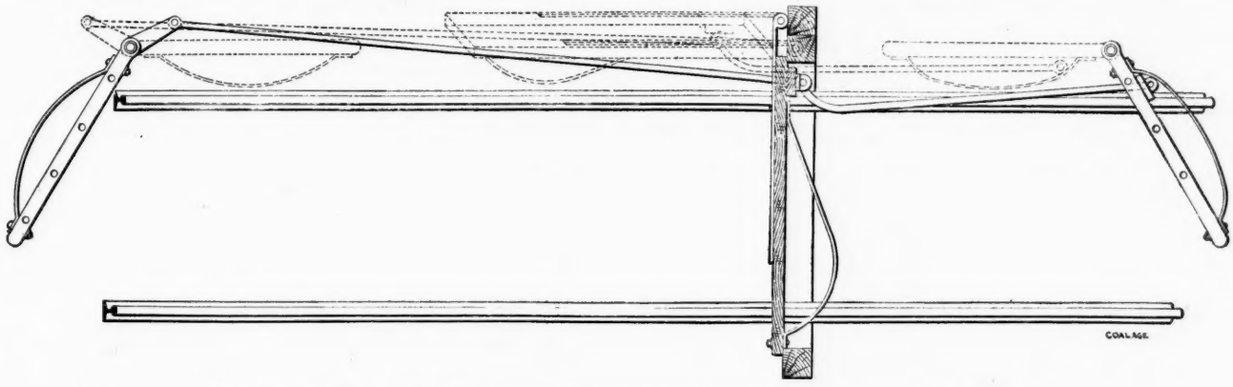


FIG. 6. PLAN VIEW, SHOWING METHOD OF OPERATING AUTOMATIC DOOR

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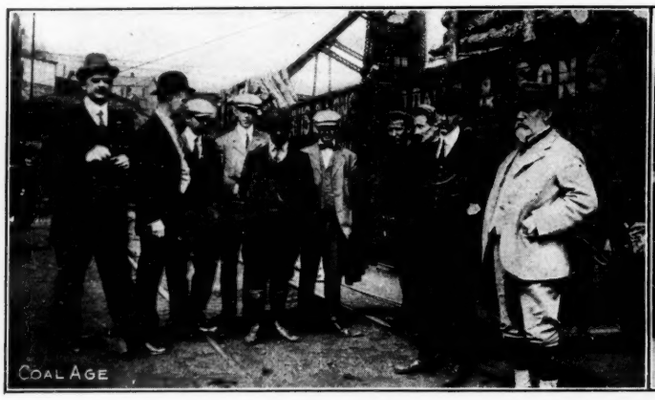
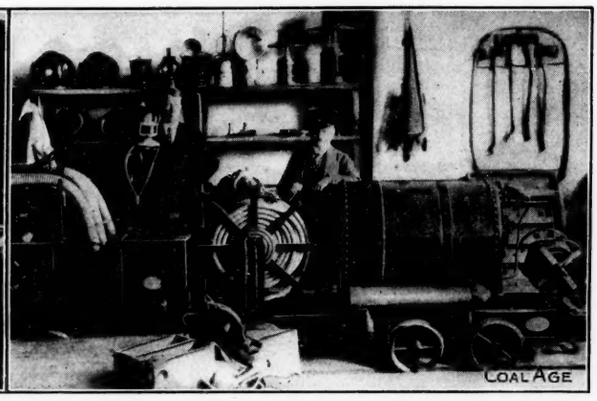
The coal supply of Oklahoma is estimated to be ten billion tons. The state contains more than six million acres of coal-bearing land. Some of the land is estimated to be capable of yielding 7000 tons per acre.

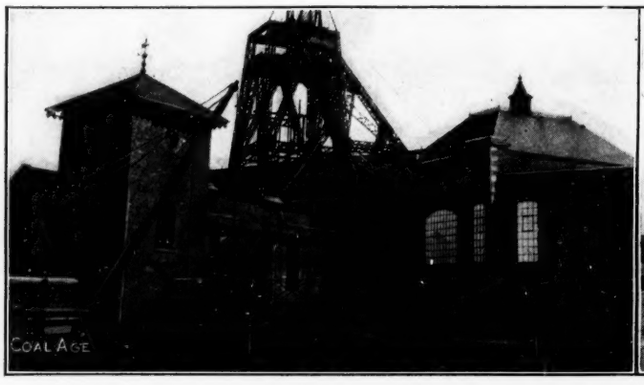
VIEWS AT EUROPEAN COAL MINES



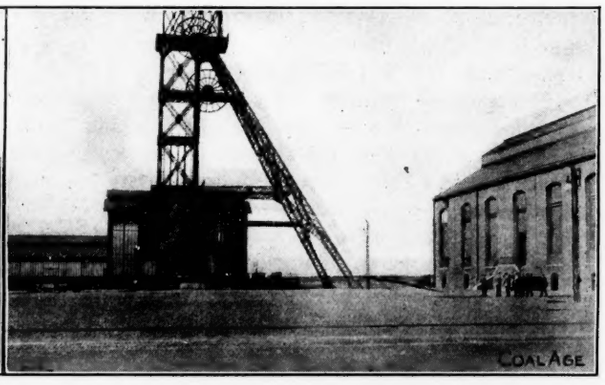
GEO. RICE, ERSKINE RAMSAY, HARRY WARREN, ALBERT JESSUP AND OTHER MEMBERS OF AMERICAN INSPECTION PARTY VISITING NO. 1 PIT AT FERNDALE, WALES



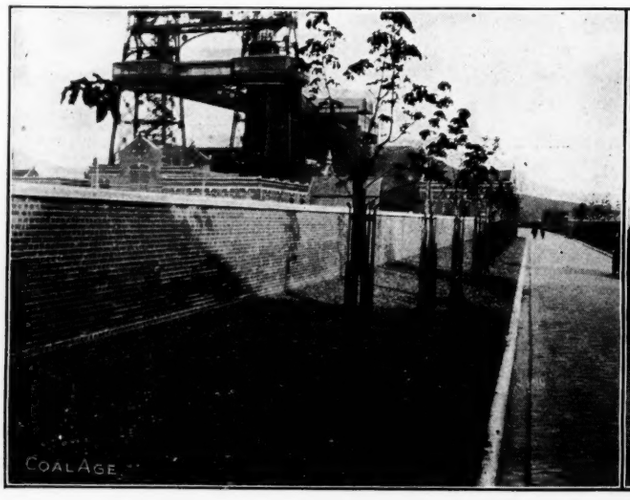
INTERIOR OF BUTHEM RESCUE STATION IN UPPER SILESIA, SHOWING MR. JESSUP AND DIRECTOR OF THE STATION IN BACKGROUND



TOP WORKS, HATTON MINE, SOUTH SHIELDS, DURHAM COUNTY, ENGLAND

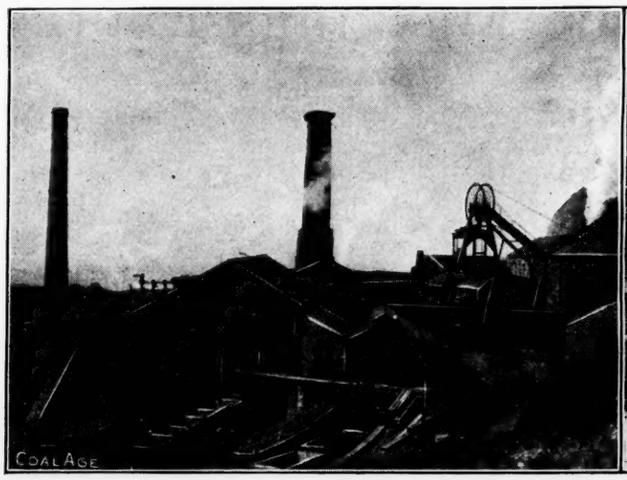


VIEW OF AN INTERESTING STEEL HEADFRAME AND HOISTING-ENGINE HOUSE

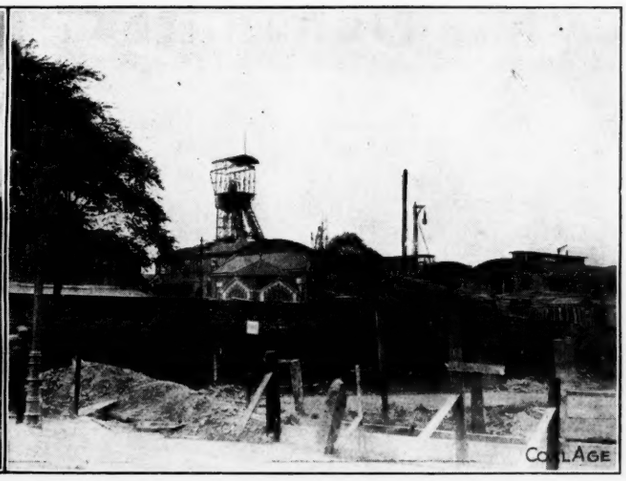


SHOWING HEADFRAME OF SHAFT NO. 15 AT MINE DE LENS, PAS-DE-CALAIS, FRANCE. THIS HEADFRAME IS 80 METERS HIGH

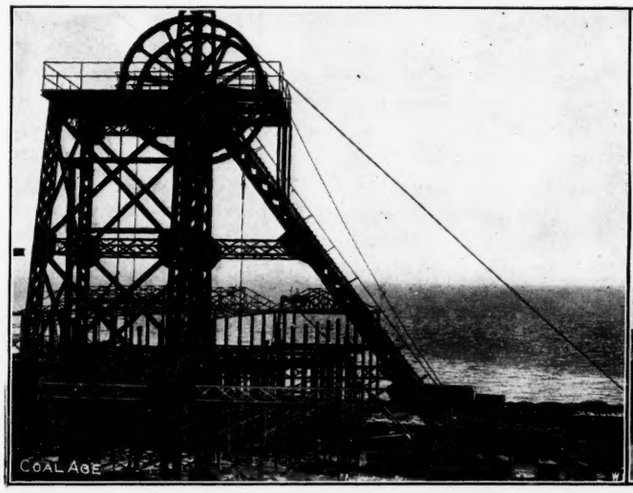
TOP WORKS OF MYSLOVITZ MINES IN UPPER SILESIA. NOTE THE SUBSTANTIAL CHARACTER OF ENTIRE SURFACE PLANT



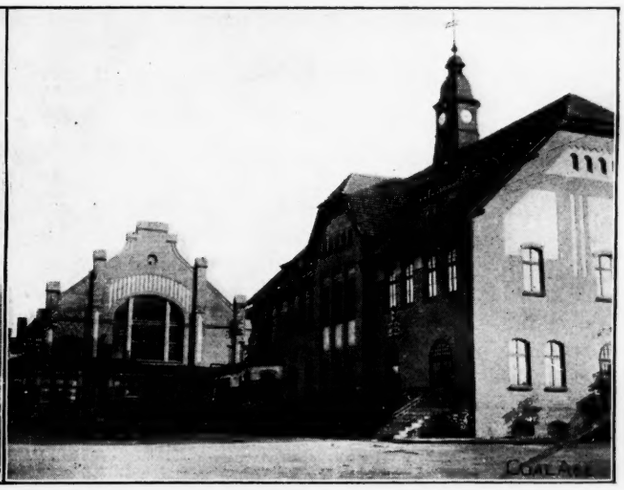
TOP WORKS AT WILLIAMS PIT, LOOKING TOWARD THE SEA. WHITE HAVEN, ENGLAND



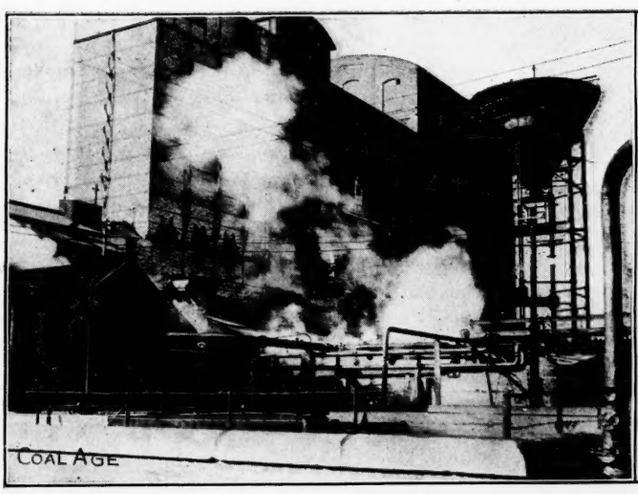
SURFACE PLANT, SHOWING STEEL HEADFRAME AT BONIFATIUS MINE, WESTPHALIA, GERMANY



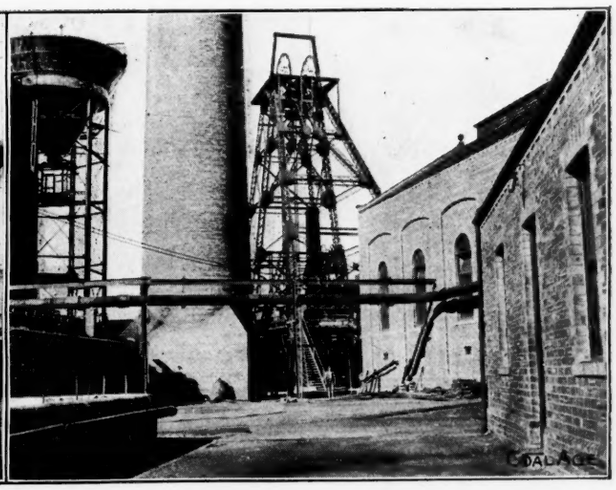
HEADFRAME AND SCREENING PLANT UNDER CONSTRUCTION AT WELLESLEY PIT, WEYMSS COAL CO., DENBEATH, SCOTLAND



OFFICE BUILDING AND MINERS' HALL AT THE LEFT IN BACKGROUND, DELBRUCK SHAFT IN UPPER SILESIA



OUTSIDE VIEW OF BAUM WASHERY AT THE WELLESLEY PIT, WEYMSS COAL CO., IN SCOTLAND



ANOTHER VIEW OF A STEEL HEADFRAME AND POWER HOUSE AT WELLESLEY MINE OF WEYMSS COAL CO.

(Above photographs published through the courtesy of John G. Bart, Russellton. Penn.)

What Dynamite Grade Markings Express

By F. H. Gunsolus*

SYNOPSIS—The grading of dynamite is actually based on its strength and not on its percentage of nitroglycerin. That chemical when absorbed by a body which does not aid explosion is not as powerful as when saturating bodies which are able to take part in the detonating action, such as wood pulp and nitrate of soda. Substances having much explosive force are sometimes added, guncotton for instance.

The meaning of the grade distinctions or "per cent. strength" mark on dynamite is somewhat of a puzzle to many consumers, and often a source of misunderstanding between manufacturer and customer.

Originally a 40 per cent. dynamite meant that the dynamite contained 40 per cent. of actual nitroglycerin by weight, but as modern dynamites do not always contain this proportion as marked, a short description of the modern practice in grading may be of interest. A slight knowledge of the history of the manufacture of high explosives may also help to explain the situation.

The Kiesel-Guhr Dynamite

The first dynamite manufactured by Alfred Nobel on a large scale was called "No. 1 dynamite" and consisted of 75 parts by weight of nitroglycerin and 25 parts of "kiesel-guhr," an inert infusorial earth, which is full of microscopic tubes and shells, and which has the property of absorbing three or four times its weight of nitroglycerin. This was truly a 75 per cent. nitroglycerin dynamite but it was not as strong as the 40 per cent. strength dynamites made today, which contain even less than 40 parts in a 100 by weight of actual nitroglycerin.

The kiesel-guhr acts only as an absorbent. It does not assist at all in the explosion and with it we can make only one grade of dynamite, that in which the kiesel-guhr holds nearly all the nitroglycerin it can absorb. If more nitroglycerin is added, it leaks from the dynamite to a dangerous extent, and if less than 75 per cent. is used the dynamite becomes insensitive, so much so that a mixture of 40 per cent. of nitroglycerin and 60 per cent. of kiesel-guhr cannot possibly be detonated at all. Advantage is taken of this property in the transportation of nitroglycerin for medicinal purposes. Kiesel-guhr is chemically inert. A pound of 75 per cent. kiesel-guhr dynamite will do just as much work and no more than 75/100 of a pound of pure nitroglycerin.

Active-Base Dynamites

The dynamites which are in use at present in the United States were originally known as "active-base" dynamites in contra-distinction to the kiesel-guhr dynamites which had an inert base.

At first to form active-base dynamites a crude gunpowder was substituted for the kiesel-guhr, but as the gunpowder was not a good absorbent, it was not possible to make a dynamite containing more than 30 per cent. or 40 per cent. of nitroglycerin; so a mixture of wood meal and nitrate of soda was used instead of the crude gunpowder. With these two ingredients, dynamites could be made with different proportions of absorbent to nitroglycerin, so that explosives containing as much as 75 per cent. or as little as 20 per cent. of nitroglycerin could be made, worked, packed and exploded.

A 40 per Cent. Wood Meal and Nitrate Dynamite Equal to a 75 per Cent. Kiesel-Guhr Dynamite

It was also found that with an active base like wood meal and nitrate of soda, a dynamite having only 40 per cent. nitroglycerin would develop as much power or more than a 75 per cent. kiesel-guhr dynamite. A reasonably definite proportion of wood meal to nitrate of soda existed at which an explosive was not so wet that it would leak nor yet so dry that it could not be "punched" into the paper shells.

The proportions of wood meal and nitrate were changed to accord with any change in percentage of nitroglycerin. More wood meal and less nitrate were used when the absorbent was to retain a large percentage of nitroglycerin. More nitrate and less wood meal or wood meal of less capacity for absorption, like fine-grained sawdust, were used when making a dynamite with a lower percentage of nitroglycerin.

Using these three ingredients with minute proportions of other nonexplosive substances required to stabilize the dynamite, a type of high explosive known as "straight dynamite" is made which when thoroughly incorporated out of well dried and pulverized ingredients, constitutes the standard of strength against which all other dynamites are graded.

Dynamite Containing Added Explosives

When other explosive substances are incorporated into dynamites they increase the power over the straight dynamite and it is then necessary to reduce the amount of nitroglycerin and otherwise modify the formula so that the new compound will develop the same power in actual work as the standard dynamite.

For instance, when guncotton is dissolved in nitroglycerin it makes a sticky jelly-like substance which when added to the wood meal and nitrate of soda makes an explosive much more powerful than one in which nitroglycerin alone is used.

If such an explosive were graded according to its actual content of nitroglycerin, it would be so much more powerful than the standard grade of dynamite that it would not be safe to use in work where the blasters were accustomed to using that standard grade, as it would break the material too fine and throw it too far and do much damage.

When other active ingredients in the absorbent were employed, it was found necessary to reduce the amount of nitroglycerin until the mixture developed the same strength as the straight dynamite nitroglycerin by which it was graded.

There are now many explosives in the market which contain no nitroglycerin at all, some of them being equal to a 40 per cent. straight nitroglycerin dynamite, and these are graded against the straight nitroglycerin dyna-

*Manager technical division E. I. Du Pont de Nemours Powder Co. Wilmington Del.

mite as described above. There are other powerful explosives widely used which contain only small amounts of nitroglycerin, sometimes from 5 per cent. to 10 per cent.—which, nevertheless, develop as much power, weight for weight, as 50 per cent. and 60 per cent. straight nitroglycerin dynamites. It is readily seen, therefore, that a customer should not feel that he has been injured when he finds that the dynamite he has been buying as 40 per cent. strength has actually less than 40 per cent. nitroglycerin in it.

Straight Dynamites Are Rapid in Action and Susceptible to Shock

While the straight nitroglycerin dynamites are still on the market, they alone actually contain the same percentage of nitroglycerin as the per cent. strength marked. In many ways they are distinctly inferior to later explosives containing less nitroglycerin, but having more of the other active ingredients in the absorbent. The straight nitroglycerins are too quick for much of the work to be performed and are much more sensitive to rough handling than explosives which have been developed more recently.

When a dynamite contains less nitroglycerin than the per cent. strength as marked on it, that difference is made up by other explosive substances so that a given weight of the dynamite is equal in strength, as developed in the ballistic pendulum and in active field trials, to a straight dynamite which contains that percentage of actual nitroglycerin.

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Central-Station Power for Coal Mines

By C. W. Beers

SYNOPSIS—The author presents the coal-corporation view of central-station power for coal mines and declares himself in favor of its further introduction where a reasonable contract can be secured. This the central-station management opposes, not understanding the nature of mine demands, which are highly favorable for power generation. He regards 0.8c. per kilowatt-hour delivered at the substation a fair figure for 50 per cent. load factor. The power-plant officials decided that the average maximum colliery demand was half the rated power in kilowatts of all the connected consuming units, not including transformers, converters and motor-generator sets. Their bid was based on this consideration.

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The purchase of central-station power by coal operators for use in and about the coal mines, appears paradoxical owing to the apparent cheapness of fuel at the mines, yet some companies have found it economical to do so, and up to the present time these companies do not regret making contracts for the purchase of power. One large coal company in the anthracite field has closed a contract with a large central station for a long term of years, and with considerable advantage to itself.

Inefficiency in the Boiler Room

A great source of loss in the present colliery steam plants today is in the boilers themselves. This is due to the fact that the firemen employed are not very intelligent and their wages are not particularly high. The result is that while fuel is comparatively cheap, little effort is made to use it economically; oftentimes the grates are ill adapted for the kind of fuel used and this is due to the fact that the fuel varies largely in quality from time to time. Draft arrangements are not always suitable, with the result that much energy goes up the stack. The boiler units are usually small in size, working at large overloads, and no arrangements are made to have them operate at their highest efficiency.

As far as the boiler losses are concerned they are subject to easy control, and one large operating company has made great strides in this direction by expending intelligent effort on the type of boiler used, the grates employed, and the quality of fuel burned.

Long steam lines poorly designed are responsible for much waste of steam. Leaks are seldom repaired, and, owing to exposed locations, the pipe covering is usually in bad condition.

From the above rough sketch of average conditions it is seen that large steam consumptions are invited, and it is a conservative statement to say that for every effective horsepower-hour used in and about the coal mines, 25 to 30 lb. (11.3 to 13.6 kg.) of fuel are burned under the boilers.

A Continual Rise in the Cost of Steam

During the last eight years, the average value of the fuel used under colliery boilers has increased in value from 35c. to 75c. per ton and it is still advancing.

Today, an ordinary boiler plant of 700 to 1000 hp. rated capacity has a steam cost of approximately 15c. per 1000 lb. (453.5 kg.) of steam generated. This figure drops to about 12c. per 1000 lb. in plants of 2000 to 3000 boiler horsepower capacity.

The correct design of a modern central-station plant for colliery operations is a rather difficult task, and it requires that the future of the mining operations be clearly forecast. This is an exceedingly difficult thing to do, and, as a result, the tendency is to curtail the initial expense as much as possible, owing to the uncertainty of future developments. Hence the plant is started on a more or less limited basis with the idea of expansion.

Variant Power Factor as Mine and Plant Grow

This is good practice, and the engineer, being eager to show good economy, installs apparatus that permits of a good load factor on the plant, and as a result shows low cost of power at the switchboard. As soon as the plant is loaded, additional apparatus must be installed. The station then will operate at a reduced load factor for some time, although there has been no reduction in the steaming expense; hence the cost per kilowatt-hour delivered to the switchboard has naturally increased.

This method produces a variation in the kilowatt-hour cost from time to time and may result in the ultimate installation of five or six machines in the plant. Idle-

Note—Paper presented at the Pittsburgh meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 18, 1913.

time periods and idle hours during the working day require that some machines work at underload and this with full steam capacity on the boilers, hence the load factor naturally decreases, and as a result the average kilowatt-hour cost is fairly high. This condition must be so, since the boiler plant does not show a proportionate decrease in cost of steam as the load falls off. The continued acquisition of generating capacity along these lines ultimately results in a high cost per kilowatt installed.

The cost per kilowatt installed varies somewhat for each particular case and for a mining central station of two 500-kv.-a. turbo-generator units the cost per kilowatt installed was found to be $110.07. This included a 100-deg. superheater for each boiler unit (1200 boiler horsepower was divided into three 400-hp. units). Stokers were also included. The plant operation was based on a 50 per cent. load factor. The following is an estimated tabular statement of the fixed charges per kilowatt installed:

FIXED CHARGES PER KILOWATT

Item	Installation Cost per Kw.	Fixed Charges per Yr. per Kw. Installed
5 per cent. interest on station cost	110.07	5.50
10 per cent. depreciation and repairs on machinery	37.70	3.77
5 per cent. depreciation and repairs on switchboard	3.00	0.15
10 per cent. depreciation and repairs on light-arrester	0.30	0.03
10 per cent. depreciation and repairs on superheater	4.80	0.48
5 per cent. depreciation and repairs on buildings	6.00	0.30
10 per cent. depreciation and repairs on coal- and ash-handling devices	5.00	0.50
5 per cent. depreciation on boilers	42.00	2.10
Boiler repairs (800 hp. at $2.25 per year)		1.80
50 per cent. depreciation and repairs on condenser (mine water)	3.20	1.60
5 per cent. depreciation and repairs on steam piping	2.00	0.10
10 per cent. depreciation and repairs on feed-water heater	1.50	0.15
2 per cent. taxes and insurance on plant cost	110.07	2.20
Superintendence, etc.	....	0.32
Total		$19.00

On a basis of 50 per cent. load factor we would have the following operating cost per year per kilowatt:

OPERATING COST PER YEAR PER KILOWATT

Fuel at 75c. per ton	7.62
Boiler-room attendants	3.42
Power-house attendants	2.00
One general electrician, one-half time	0.75
Oil, waste, etc.	0.20
Water	2.12
	$16.11

From these figures it will be observed that there is a fixed charge of $19 per kilowatt installed, which is a constant, regardless of the load on the plant. On a basis of 50 per cent. load factor there is a yearly charge estimated at $16.11.

At this point in the argument it is well to consider these values. Under the item of fixed cost the values of depreciation and repairs may be considered high. This is not the case. It must be remembered that the plant is installed as a mining plant to suit mining conditions, and not a main central station in some city. The care exercised in preserving efficiency, etc., is in proportion to the intelligence of the help employed, hence the plant may be considered to depreciate rapidly for two reasons:

First, variations in the proposed life of the plant or additions may be required from time to time, with the result that present capacities may be hardly operated before the necessary additions are made, thus bringing about a condition of hard usage; second, obsolescence of equipment. The first reason naturally carries with it large repairs. For these reasons the above values, from which the fixed charge of $19 per kilowatt is obtained, are considered fair.

The operating costs for coal, water, labor, etc., are the real bones of contention, and at best, their estimate is simply a guess, and the nearer the load factor approaches unity the better the guess. It is at this really crucial point in the estimation of the kilowatt-hour cost, that many fail, simply because of the high value of the load factor assumed.

Load Either below or above Maximum Efficiency

The investigation of a mine load shows that on account of hoisting, locomotive, and other variable power service, the load naturally varies largely in a plant of the above rating, the variable load being such as to cause the generators to be temporarily overloaded many times during the day. Also, for many intervals in any 12-hr. period they are run at underloads, and neither condition tends toward the best economy, although the load factor based on the kilowatt-hours generated may be fairly high.

The result is that a large portion of the kilowatt-hours developed is on ascending parts of the water-rate curves of the prime movers, and, hence, we approach a condition of good load factor on a reduced steam economy. It is such conditions as these that cause the ordinary mine central station to differ from the regular city central station in which the load varies at uniform rates.

The Annual Load Factor

Another condition that tends to destroy the calculated load factor is the idle-day periods, and, when pumping must be taken care of, the absence of large quantities of water. It is estimated that 105 days per year are idle days, and naturally on these days the load factor is not nearly so good as on the regular working day, and particularly is this true if pumping is not required during a part of this time.

The fixed charge of $19 still keeps on working silently and so does a large portion of the $16.11, due to operating expenses. The only items of this charge that show any real decrease are the coal and water. Therefore, we see that while it is possible to estimate the average kilowatt cost per year at a total of $35 or $0.008 per kilowatt-hour on a basis of 50 per cent. load factor, there are conditions which are apt to change this figure considerably.

It will be observed in the original estimate of $110.07 per kilowatt installed that no reserve or emergency equipment has been included. If such had been the case, then the fixed charge of $19 would have to be considerably increased, with a resulting increase in the estimated kilowatt-hour cost.

A number of calculations on mine power plants up to and including 1500 kw. capacity resulted in a close agreement of all the figures, which may be expressed in concrete form as follows:

AVERAGE FIGURES ON POWER COSTS

Cost per kilowatt installed	$110.07
Fixed charges per kilowatt per year	19.00
Operating charges per kilowatt per year	16.11
Net cost per kilowatt-hour at switchboard	0.008
Load factor	50%

A careful study of these statements by the engineer will bring to mind the following questions: "Why must I be saddled with a fixed charge of $19 per kilowatt?" and "How can I improve the load factor within safe station limits and reduce the kilowatt-hour cost?"

Some years ago a large central station of 40,000 kw. ultimate capacity, located in a mining region, endeavored

to interest the company by which I am employed, in central-station power, but lack of understanding of mining conditions on the part of the central station always interfered.

Price 8 Mills per Kw.-Hr., 50 per Cent. Load Factor

Finally it became apparent if the power company could be induced to sell to the mining company at a rate not exceeding eight mills per kw.-hr. on a 50 per cent. load factor basis, that the proposition would be a fine solution to the above perplexing questions, and it was with this idea in view that the mining company ultimately took up the consideration of central-station power in earnest.

A close study of colliery conditions, such as the expected load factor, periods of high and light loads, peak loads, etc., indicated that if a complete understanding of conditions could be made clear to the power company a contract advantageous to all parties concerned would be considered.

Later a contract was executed to the satisfaction of all concerned in which the charge per kilowatt-hour was based on load factor only.

Before the contract was signed the following points were taken up and thoroughly discussed:

(1) On what basis current would be paid for. (2) Territory to be covered by the contract. (3) Location of meters for registering the power consumed. (4) Delivered voltage, power and point of delivery. (5) Maximum demand charges. (6) What apparatus should be considered as "connected" load and the methods of rating the same? (7) The included rating of apparatus used intermittently. (8) The method of determining load factor. (9) Pole-line charges—co-party lines. (10) Power factor. (11) Explanation of terms used. (12) What constitutes a substation.

The discussion of each of the above topics brought out the following arguments for their adoption, and at the same time illustrates the items which should be considered in any contract between a central station and a mine operator.

Power Cost Varied with Power Factor

(1) Current could be paid for, either on the "straight maximum demand basis plus cost per kilowatt-hour," or on a varying rate depending on the load factor. The latter plan was argued and adopted, because it is a simpler method of handling all charges. It eliminates errors due to wrong reading of graphic meters, and hence prevents argument as to the demand.

To the ordinary mind, it presents the idea of cheaper rates in a clearer manner than rates based on the demand system, as the only point to be observed is that the greater the load factor the less the rate; whereas the straight demand system has a tendency to curtail consumption, due to the fact that the demand power may at times be cumulative, and hence the operator may feel worried as he sees the increase on his demand chart, although his kilowatt-hours may not increase.

(2) The contract to be of benefit should be made to cover all territory that a private mining plant could ultimately cover in order that maximum results in load factor would be obtained.

Current Measured on Secondary Side of Transformers at Substation

(3) The preferred location for meters should be on the secondary side of transformers. This is not absolutely necessary if the central station installed the meters. In any event they should always be located in the customers' substation.

(4) In this case the power company agreed to deliver direct into the customer's substation, consequently it seemed fair and equitable to permit the power company to deliver the power and voltage from its nearest available lines. This particular power delivery should always be specified by letter for any particular substation; experience has proved this to be satisfactory.

If the customer was required to build his line into his own substation then he should have the privilege of determining his own voltage in order to suit his delivery requirements. This would eliminate the cost of probable transformers on the part of the customer in lieu of the investment required by the pole line.

Maximum Colliery Demand One-Half the Total "Connected" Load as Rated

(5) Under (1) it was decided to use a sliding rate per kilowatt-hour rather than a charge based on maximum demand. On what would the maximum demand be based? Certainly not on the momentary maximum starting loads of motors, as the starting peaks would scarcely be noticed on the load curve of a station of 40,000 kv.-a.; neither could a two- or three-minute peak be used on account of the difficulty of properly analyzing curves for such a time limit, as errors would naturally be introduced by the thickness of the line; neither could a five-minute peak be used, because this would tend to eliminate hoisting and this would be unfair to the central station, as much hoisting is done on a one-, two- or three-minute basis.

To settle this question the central power-plant officials visited many plants in the mining regions, and found from actual observation that the rating of the "connected" load was just about twice the average maximum demand that occurs on the plant. Experience proved this to be fairly close, hence for the term "maximum demand" a figure was used that was equal to one-half of the total "connected" load, rated in kilowatts.

(6) Since the basis of cost was load factor and since the "maximum demand" as outlined above is used in lieu of station capacity it is necessary to correctly define the "connected load."

This to consist of all direct power-consuming devices (no transformers, converters, motor-generator sets, etc.), and is equal to the sum of the nameplate ratings of all motors, or lamps, or heating devices, etc.

Exceptions. Direct-current hoists and direct-current locomotives to be rated on one hour nominal rated basis. Alternating-current hoists to be rated on their continuous basis, and where transformers are used for lighting only, then the full kilowatt rating of the transformers is used.

Reserve Equipment Reckoned as Part of "Connected Load" in Month Used

(7) Suppose reserve equipment should be installed, such as pumps, to give protection in time of floods. This equipment would be in service only a few weeks total time per year. It was considered equitable to include this apparatus only for the month during which it was used. It is reasonable to state that in a private mining plant emergency conditions are given preference, and, there-

fore, other apparatus would not be worked; for this reason it was considered that such reserve equipment should not be carried from month to month as connected load.

(8) The method of determining load factors was intimated in (6) and is as follows: Let the total manufacturers' nameplate rating of apparatus used during the month equal 500 kw. and let the total kilowatt-hours used during the month of 30 days equal 72,000; then the maximum demand is equal to 500 divided by 2, equals 250, and the average demand is equal to 72,000 divided by 30 days times 24, equals 100; therefore, 100 divided by 250 equals 40 per cent., which is the load factor. Reference to the cost curve shows the rate to be approximately $0.009; therefore, the charge for that particular month would be 72,000 kw.-hr. times $0.009 equals $648.

Power Company Builds Transmission Lines

(9) If the coal company should require the power company to build a line expressly to reach a substation, then it seems fair and equitable that the power company should be paid a rate that will represent the total investment charge on the line. However, if the coal company uses power of a value in excess of this investment charge, then no pole-line cost shall be included in the monthly bill, but if no power is used then the full investment charge is to be paid. This service was fixed at 15 per cent. of the pole-line cost.

Exceptions. If the power company should place extra customers on this line, then this 15 per cent. line charge should be prorated among the various customers in proportion to their respective "demands."

Inadvisable To Use Induction Motors

(10) At all times it is to the interest of the coal company to have the proper voltage. The installation of considerable amounts of induction machinery tends to destroy this feature, and may cause trouble to pumps, fans and hoists, hence to protect itself it is good policy on the part of the coal company to use power-factor correcting devices judiciously.

(11) In order that no errors in calculations in load factors, etc., could arise through ignorance, the power company considered it advisable to make use of definitions that clearly explain the following terms: Maximum demand. Manufacturers' nameplate rating. Load factor. Day.

(12) To suitably define the word "substation" it was determined that all operations which could be conveniently grouped under one colliery lease should be known as a substation.

Day Load Occurs Opportunely; Night Load Is Constant

From the above discussion of the elements of a power contract it is seen how essential it is that the central-station management should be made to understand colliery operations thoroughly and the conditions relating to connected loads, and in addition they should be made to appreciate the fact that the day load is highly desirable as it reduces their station losses and increases their load factor to a very high degree, and when the night loads occur that they are usually of the constant-duty kind.

Failures on the part of others to obtain satisfactory rates could, no doubt, be charged directly to this lack of knowledge on the part of the central station which is due to the failure of the mining company to coöperate properly with the central-station management.

The company with which I am connected has been operating on central-station power for about one year, and up to the present we have about 1000 kw. connected load consisting of fans, pumps, hoists, locomotives, and heaters, and provisions are being made to increase this amount in the near future by about 2500 kw. Plans are now under way to remove the present boiler plant from one of our collieries and operate entirely by power from the central station.

Observed Advantages

Since operating on central-station power, a number of features have presented themselves that make it appear a satisfactory arrangement. They are as follows:

1. Our average kilowatt cost is lower than the estimated kilowatt charges in the ratio of about 7½ to 8, and this kilowatt charge is based on delivery at our substation meters, and not at the main power-house switchboard as per the original data.

2. The company is more ready to consider additions to its power equipment, due to the fact that main power-plant costs have been entirely eliminated and do not appear in the estimate.

3. There is always a "readiness to serve" on the part of the central station and this is seldom true of the mining power plant.

4. There is absolutely no worry due to power-plant operation.

5. In case of holidays, etc., the monthly rate per kilowatt-hour will only slightly increase, which would not be the case in those plants operated by the mining company, for, in such plants, labor and fuel decrease but little.

6. As electric operations are increased, less demands are made on the colliery boiler plant with the result that coal will be sent to a ready market which otherwise would be burned under the boilers, and ultimately this will be no small amount of fuel.

7. The use of central-station power affords a remarkably cheap method of reaching isolated banks, and isolated pumping problems. Operations, such as small washeries are more or less temporary in character, and can be advantageously worked without causing the distress that might be occasioned when operated from a mine central station.

8. The service is reliable. Our service up to the present time does not total more than 15 min. delay, due to failure of supply, and these failures were directly due to lightning.

9. The effect of efficiency is not particularly noticeable, hence air gaps can be made larger, which is highly desirable in mining apparatus, as it reduces the danger of breakdown.

In the above discussion I have presented the case of mine central station vs. public-service corporation supply as it appears to me. My experience has been somewhat limited, but the longer the service is continued the more I am convinced that the purchase of power from public-service corporations offers advantages that should not be overlooked by mining corporations.

The Pittsburgh Meeting of the A. I. of E. E.

By R. Dawson Hall

SYNOPSIS—Many papers of pertinent interest to the coal industry were presented at this meeting. Some of the more important of these were published in our issues of this week and last week. This article is a complete summary of the discussion of these different articles.

The American Institute of Electrical Engineers met Apr. 18, in the English Room of the Fort Pitt Hotel in Pittsburgh, at 10 a. m., with about 150 members and guests present.

R. D. Mershon, the president, made the opening address and called the attention of those present to the formation of a new technical committee on the Use of Electricity in Mines, presided over by George R. Wood of the Arcade Building, Philadelphia, Penn.

Banquet of the A. I. of E. E., Held at the Fort Pitt Hotel, Pittsburgh, Penn., on the Evening of Apr. 18

To speed up the presentation of papers the addresses of H. C. Eddy entitled "Purchased Power in Coal Mines," published in our last issue, and that of C. W. Beers, published in the present issue on "Central Station Power for Coal Mines," were read consecutively without intermediate discussion. Whatever the nature of the presentation, the parties most ready to discuss the papers were those in sympathy with the public central station. There was a disposition to regard the uptodate central station plants of the mine operators as quite small.

Thus one speaker said that the usual needs of a colliery were from 100 to 300 hp.; that as the coal used was worth $1 a ton and the load factor only about 20 per cent., he thought Mr. Beers had been too conservative in stating his case because the average mine purchasing power was expending not 8 mills per kilowatt-hour but as much as 2c. This is very true. Such small plants certainly do well to buy such power where an 8-mill rate is available.

Is an 8-Mill Rate Reasonable?

The speaker brought Mr. Eddy to his feet and he stated in reply that his company was willing to sell power for 8 mills per kilowatt-hour under reasonable conditions and Mr. Beers remarked that his company was purchasing much of its power at 5.3 mills per kilowatt-hour.

Mr. Eddy declared that many power companies would readily sell power to coal companies at less than the average year round cost at the switchboard so as to reduce the dead losses of the off-peak period. The chairman stated that most of the mines demanded today at least 300 kw. and that there were 12 or 15 alternating-current central-station plants in the field of which Mr. Beers spoke. One speaker stated there were 200 companies already using central-station power.

Shall the Coal Operator Buy or Sell Power?

Obviously if central-station power were furnished by the coal operator with up-to-date equipment and if the plant were located at an ideal spot for domestic distribution, he should be able to make as much profit in entering the business as any one. There is nothing of a magical nature in the manufacture of power, that he could not combine this with the production of coal. Every argument in favor of the central-station supplying power to the operator is of equal force and value in favor of the coal producer supplying the power consumer with electric current.

It is a certainty that the average operator today disregards the ratio of power actually used to power on the rate-plate of his apparatus; in his estimate he coolly divides the rating of his equipment in kilowatts into his daily expense, divides this by his working hours and thinks he is getting his true kilowatt-hour cost. But as

he is not using so much power for any length of time as the rate plates of his machinery indicates, he should realize that the figure he places as the cost of his hourly requirements is low. He must realize that because his generators are rated at 500 kw. he is not necessarily using that amount of power every moment of the day.

Safety in Mines

The next paper read was that by H. H. Clarke on "Safeguarding the Use of Electricity in Mines." The most interesting remarks in this paper are not for immediate publication as the institute withholds it till it can be entered in the proceedings. The greater part of the paper was of a character hardly new, (except in the manner of expression) to those who have followed the bulletins of the bureau and modern safety literature. It was designed mainly for electrical engineers whose experience was not so definitely subterranean.

Mr. Clark gave an interesting description of an explosion caused by the ignition of a canister, containing 5 lb. of powder. The explosion seriously burned several men who were in a mine car seven cars removed from a mine locomotive.

In the discussion attention was called to the dangers and lack of economy in light equipment. The use of much sand to obtain adhesion made accidents likely from the imperfect grounding of the motor, increased the resistance of the cars to traction and reduced the available voltage for the propulsion of the motor.

Mr. Clark instanced a case where three shots were connected in series to be fired by attachment to the trolley wire. The miner withdrew to fire them by electricity. He had barely left the room when one went off. He reconnected the other shots and without passing a current through the leads, another explosion took place almost as soon as his back was turned. An engineer present recalled a case in West Virginia where a miner tried to fire shot with a battery but failed. He went back on the shot and was met by the blast which was exploded by some unknown means.

Mr. Clark did not believe that induction could be the cause of these premature explosions. He explained that the sensitiveness of detonators varied, and consequently one would be fired before the other and break the connection. He could possibly have reasonably added that the resistance might vary and the igniting effect differ.

The Portable Electric Mine Lamp

And here may be mentioned another matter which further exemplifies the injustice done electricity. Mr. Clark declared probably without ulterior meaning, that the electric lamp should be perfectly safe, because it could ultimately be made 100 per cent. efficient. We do not demand this ideal of its predecessor, the oil safety lamps; why demand it therefore of the new light unless indeed 100 per cent. efficiency is now to be considered achievable?

The British government has approved two lamps, one oil and one using electricity. The first is for general use and the second is only for the use in rescue work. The electric lamp has adaquate protection and if I mistake not is the safest but the British Home Office does not regard it with as much favor. This is largely due to prejudice.

The Bureau of Mines officials have always contended that no lamp burning oil gave a perfect assurance of safety and have regretted that the word "safety" was ever appended to the oil lamp, while a better word like "permissible" was already in the dictionaries.

When the gauze of a lamp is broken or dirty, the glass fractured or improperly sealed and the air is traveling rapidly and is explosive, when extremely gaseous atmospheres are encountered or when the lamp is held out of the perpendicular, the oil safety lamp is not reliable. Hence, when we show that a blow which breaks the bulb without immediately severing the filament, will cause a minature electric lamp to ignite gas, especially if the battery is overcharged, we do not show concurrently that the lamp is as unsafe as a safety lamp burning oil, provided the risk of breakage of the bulb and of the oil lamp glasses are equal. There are also many other ways beside breakage, whereby an oil safety lamp can explode gas, and in which it shows itself to be undesirable.

When an electric bulb is further strengthened by a heavy glass cover and arranged to go out as soon as the glass is broken, it becomes much more reliable than the oil safety lamp, however well shrouded by gauzes and glasses the latter may be. Let us remember that a suddenly exposed tungsten filament of one candlepower "frequently" ignites gas and one of a half a candlepower *may* fire it, but is "unlikely" so to do.*

The Prone Method of Resuscitation

Dr. C. A. Lauffer gave a demonstration of the prone or Shaffer method of resuscitation, and he remarked that the importance of such methods for aid in emergencies will never cease till oxygen resuscitating apparatus can be rolled up and snugly packed away in a vest pocket. There will always be accidents where pulmotors will not be immediately available. Doctor Lauffer has instructed 2000 men in the prone method and he cited the fact that the system of resuscitation had the indorsement of the National Electric Light Association. In this method, the unconscious person is rolled over till his face is downward. His head is then turned to one side, so that his mouth does not lie in the dirt or in such a manner as to prohibit breathing; the head must, however, be given a sufficiently downward inclination, so that the tongue falls naturally forward, giving freedom for respiration as soon as that function is restored. Water will naturally fall out of the victim's mouth, thus aiding in the clearing of the air passages. The arms of the patient should either be spread out or placed above his head.

Location and Duration of Shaffer Compression—The attendant then preferably straddles the patient, dropping down onto his knees. He grasps the victim with his hands, placing one on each side of the patient over the eleventh or twelfth rib. The location of this hold is all-important; made too high or too low, no good result can be obtained. Perhaps the place where the pressure should be imposed is better defined as about 6 in. above the upper line of the victim's trousers, though Doctor Lauffer is not responsible for that statement.

A gentle but firm pressure is placed on these parts of the man's body for 3 sec. The time is important and should be regulated, either by a watch, by counting three or by the attendant judging by the working or his own breathing. Rapid breathing is a strain on the normal

*The words in quotation marks are from Mr. Clark's recent report on "Ignition of Mine Gases by the Filaments of Incandescent Lamps," page 30.

human being and cannot long be sustained. It is likewise impossible to induce the frequency of respiration of a panting victim, who by drowning or shock has an even smaller ability to breathe than a normal human.

How Much Force Should Be Used

The pressure should be imposed and removed every 3 sec. till the patient recovers or is adjudged utterly beyond hope of recovery. The number of compressions and dilations thus secured should each total 12 per minute. The pumping action induced tends to discharge water from the air passages and thus aid in keeping those channels cleared for respiration.

The attendant can use his weight to effect the required action, so that a strong man is not needed, nor does it demand much energy. Unless the one injured was affected with cancer or tuberculosis before asphyxiation, there is no risk of injuring his ribs by excessive pressure. But such "living museums of pathologic ills" are not usually found among miners or linemen. Continue to press harder till you feel the ribs give way under your hands. Some victims resist the pressure unconsciously and sufficient force must be applied.

Stimulants—Doctor Lauffer did not advocate the putting of hypodermic syringes in the hands of linemen for use in cases of suspended respiration. Aromatic spirits of ammonia, applied to the nose, are helpful. So also is domestic ammonia, if the other cannot be obtained, but as the strength varies with the honesty of the manufacturer, and its age, it is well for the attendant to first try it himself and see how much it has been diluted by solution and evaporation.

As for heart stimulants, atropine is the best with strychnine the second favorite; either one or both can be given, but care must be exercised, as heart stimulation can be overdone. Digitalin, cactin and camphor in oil are all good stimulants, but present greater possibilities for harm than help if administered by amateurs.

How Long to Persevere—Doctor Lauffer stated that his students had restored six men who were injured by electrification, drowning and other forms of asphyxiation. In reply to J. S. Jenks, who remarked that he had seen men brought back to life after 1¾ hr., Doctor Lauffer stated that results had been obtained after as much as 2¾ hr. of work, but that most men revived after 20 min. One man of 57 years of age, who fell 9 ft. onto a concrete pavement, came around in one hour, sufficiently to cause him to vomit. Yet, even with the aid of a stethoscope, his breathing could not be detected when resuscitation was commenced.

Doctor Lauffer's remarks ended the morning session and the meeting, after a short recess, reassembled nominally at 2 p.m., but actually much later.

Variable-Speed Mine Fans

F. B. Crosby then read the most severely technical paper of all those presented, entitled "Alternating-Current Motors for the Economic Operation of Mine Fans." The discussion took two divergent paths: Whether Mr. Crosby's system covered all and the most desirable forms of speed-variation provisions, and whether, after all, the operator was wise in demanding variable speeds or at least whether a choice of two would not suffice for ordinary operating conditions.

Mr. Beers objected that the paper was restricted in application to large fans. It did not meet the needs of the anthracite region where the fan used is rarely more than 100 hp. and sometimes only 50. He regarded constant speed as highly desirable for regulation, but a variable speed involved, in his opinion, a variable pressure and excessive water gages were undesirable, because they are so uneconomical. He preferred to let the fan run at any even number of revolutions per minute and make up for the increased length of the headings to be driven, by increased cross-section or by additional splits. He regarded the simplicity of the squirrel-cage motor as a great element in its favor and urged its continued use in mine ventilation.

Another speaker stated that many other methods of speed regulation were available, some of which are more simple than that Mr. Crosby had outlined. All evidence to the contrary, he said that the Americans always demanded heavier machines than the foreigners. I had always supposed that all foreign machinery was proof against fire, flood, earthquake and the suffragettes, but there are apparently people of a different opinion. The foreign apparatus described was not only light, but complicated and would require expert supervision, such as was given machinery in Germany.

A speaker who appeared to have a most complete knowledge of German conditions, countered with the statement that variable-speed fan motors were being run in Germany by superannuated miners and not by trained men. Some of the stations were kept locked and were tended by a man only once a day. The German experts and operators regarded the regulating set as a great advantage, since it saved so much power, that the purchase price of the apparatus was soon returned in reduced operating costs.

Is a Variable-Speed Motor Wanted?

One speaker advocated either a two-speed motor or a variation in speed by changing pulleys. He pointed out that the variability needed was not diurnal or monthly or even yearly. There came a time when the initial speed failed to meet the requirements of the enlarged mine and then a change in pulley ratios could be made without much trouble. The "delay" could not be called "annoying" or the "method" a "make-shift," since the change had only to be made once. A belt was necessary in any event as the motor and fan could not be run at one and the same speed.

As Mr. Wood explained, the need for a variable-speed motor is more marked with a new mine than an old one, and he did not see why, when full speed was needed, the regulating set with its complications could not be entirely discarded.

But the advocates of variable speed, found a supporter who believed in a reduction of speed at night, because less air was needed when few men were in the mine. That is true, though where much gas is generated, practical men in this country are not much interested in speed reduction, though it is considered important in Germany. Strange to say, no one instanced the difference in barometric pressure as a reason for the use of variable-speed motors. This speaker further advocated arranging for a belt reduction to make up the difference between the requirements of a new and old mine; also a two-speed system to make the change in revolution from the day air current to the lesser night ventilation.

H. L. Beach had his own solution. He purchased two squirrel-cage motors made by the same firm and having exactly the same characteristics. One he installed on temporary work, and one was set up for the driving of the fan. So far the increase of speed needed to take care of the extension of the workings has been obtained by a change in the pulley ratio, but the time is arriving when the second motor will be needed and it will be used to assist in driving the fan.

Mr. Crosby declared that in his paper he did not intend to discuss ventilation. The problem of variable speed was given to him for solution and his paper was a reply to the question, "how to vary," and not to the one of, "why vary."

Low-Load Factors

J. S. Jenks then read his paper on "Central-Station Power for Mines," prefacing it with a few remarks on the impossibility of fixing (without consideration of local conditions), the proper number of mills per kilowatt-hour which the consumer should pay to the public central station. He made the statement that the load factor was often as low as 20 per cent. and might even run as low as 6 per cent. In an average of over 200 installations, it had fallen under 40 per cent. He did not, however, define "load factor."

H. M. Warren then read the paper, of which he and A. S. Biesecker were joint authors, entitled "Characteristics of Substation Loads at the Anthracite Collieries of the Lackawanna R.R. Co." The discussion turned: (1) On his definition of "load factor," which expression he chose to use to express the ratio of the average load to the rated connected loads; (2) on the fact that his "one- and five-minute peaks were measured as block peaks," and did not give the integrated kilowatts.

In the discussion there was no lack of speakers and everyone seemed to have his own way of calculating load factor, some figuring in four or more ways, according to the classification of the customer. Not one adhered to the definition which was placed upon the word for the sole purposes of the paper. Nor did the more general version of load factor meet with approval, viz., ratio of average load on the station to the rating of its included machinery.

Mills per Ton Mined or Mills per Kilowatt-Hour

The definitions given by the public central-station experts varied so much that it was no wonder Mr. Wood declared that the operator would hesitate to commit himself to a bargain with any of them except on the basis of so many mills per ton of coal mined.

Some compared the minute peak with the average monthly demand. Some took the 5-min. or 15-min. or 30-min. or the 1-hr. peak and found its relation to the average power used in determining the load factor. Again it was said that all the peaks should be integrated and further some thought that a single peak towering above all others should not be given such a prominence in figuring, so that they took the three highest peaks in the year and divided by 3 instead of a single isolated peak.

Induction vs. Synchronous Motors

The question of the induction and synchronous motors was then brought up and one speaker declared that the current supplied was the crux of the whole question. When induction motors started there was a watt-less current, and therefore even if pure current considerations did not enter into the question, the load-factor should, in any event, have a bearing on the price paid for power.

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The Explosion at Finleyville

Shortly after 1 o'clock, on the afternoon of Wednesday, Apr. 23, the most disastrous explosion that has happened in this country for more than a year, occurred at the Cincinnati Mine of the Monongahela River Consolidated Coal & Coke Co. Present indications show that about 100 men have been killed.

This mine is located near the Town of Monongahela, about 15 miles in a straight line south of Pittsburgh. It is one of the oldest mines in the Monongahela River Valley. The Monongahela River Consolidated Coal & Coke Co. is a subsidiary of the Pittsburg Coal Co., the latter owning practically all of the preferred and 94 per cent. of the common stock of the former. The Monongahela Co. has been for the most part independently conducted, although a portion of the operating staffs of both companies is the same for economic reasons.

The mine is a drift operation and has three principal openings. Having been in operation for such a long period of time, the workings are quite extensive. It has evidently been considered dangerous from a dust and gas standpoint, reference being found in the Pennsylvania Mine Inspector's report for 1909, where the dust was being laid by a water wagon. In later reports of the Pennsylvania inspectors the mine is also rated as gaseous.

It is ventilated by an electrically driven Capell fan, which in 1911 was furnishing 129,000 cu.ft. of air per minute, at a developed water gage of 3 in., the fan running at 157 r.p.m. The inspector's report for 1910 shows that the air was divided into twelve splits, but this was reduced to eight in 1911, a portion of the mine evidently having been closed off during the intervening period.

The ventilation in the mine, according to the Pennsylvania Mine Inspector's report for 1911, was considered good in some portions and fair in others. The report further states that the defects were not due to lack of adequate power, or the most advantageous arrangement of openings and airways, but rather to a lack of attention to details and over-splitting the air. It appears that brick and concrete stoppings were freely used, there having been some 70 installed during the year 1911, together with three brick overcasts. The slope at the second opening was enlarged at this same time, a 10-ton locomotive put in service, and a Morgan-Gardner longwall electric mining machine installed.

Up to the present moment, the information available as regards the cause of the explosion is meager and entirely unreliable. It was, however, evidently of great force, press reports stating that windows in buildings several hundred feet from the mine mouth were shattered and a 15-ton locomotive completely turned over. The fan house and fan were also seriously damaged, and the ventilation of the mine badly crippled. It is evident, however, that the explosion was not general throughout the entire mine, as some 70 men made their escape. From the information now at hand, most of the fatalities have been caused by afterdamp rather than by the force of the explosion itself. A detailed report will be published in Coal Age next week.

EDITORIALS

The Prime Need of the Workingman

The average workman does not believe that the greatest of his personal needs is efficiency. The attainment of that quality, he thinks, is a pretty problem for his employer. He admits that there may be something dishonest about loafing but it is a vice which concerns only the corporation which employs him.

The social condition will never be bettered measurably till the operative, miner or mechanic, learns that he is engaged with others in supplying the world with what it needs. If he or his fellows in other industries produce but little, the world receives a smaller proportion of its wants and, as he is part of the world, he himself suffers.

Efficiency is the humbler worker's problem; if two blades be induced to grow where but one grew before, the second blade on the stalk, from its root almost to its very tip, will fall to him. We admit he is concerned in the relative distribution of the awards of labor but he is even more interested in the bulk of that prize of which the workers as a whole get by far the larger share.

The waste of labor and material is a moral question and it is an appropriate consideration for us all. The operator who fills his mine with men, in excess of his power to supply them with cars is depriving those men of their due opportunity to make money and is withdrawing from the world a certain amount of valuable labor. The man who neglects to put his mine in such shape that work can be performed with minimum effort is wasting the limited labor of the world's markets.

On the other hand, the miner who opposes improvements in production, mining machinery and mechanical devices is endeavoring to constrict the world's output which output is destined ultimately to find its way in part into his own home.

We read of the "class consciousness of the working man" and of the "solidarity of the laboring classes." Has the workman's social consciousness and his unionism done him much good if he has not learned that the main duty of the consuming worker to the working consumer is to work as efficiently as he possibly can.

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Adequate Boiler Foundations

The matter of proper and adequate boiler foundations is one which is not infrequently neglected around coal mines. This is, generally speaking, not a wilful oversight but arises from ignorance.

In laying out and building boiler foundations, they should be made sufficiently deep in the ground to strike good, solid, natural earth, and not be laid upon any filling. A layer of concrete at least 8 in. thick should be placed under the entire boiler and setting, and not merely under the side walls.

Above this layer of concrete, and up to the floor line, the foundations for the boiler may be built up of either concrete or hard brick laid in cement mortar, care should be taken, however, to make the top of this foundation, or the points upon which the boiler supports rest, perfectly level.

If proper precautions are not thus taken to have the boiler set firm and true, it is almost certain, sooner or later, to settle at one or more points, thus bringing undue strains upon the pipelines, which are connected to the steam nozzle. These in course of time may cause rupture of the steam pipes with attendant danger and possible loss of life, to say nothing of the loss in time and the inconvenience required in making repairs.

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The Purchase of Power

At the vast majority of collieries, or, for that matter, in most coal-mining regions, there is one and only one source of power, and that is coal.

There are some regions, however, which are situated within the reach of transmission lines from water-power developments. There are also many power companies, and their numbers are constantly increasing, that are generating current in central power plants, transmitting it at high voltage, and selling same to the various mining companies within reach of their transmission lines.

The question of buying power from some outside company, or generating it at the mining plant, hinges upon the difference between the cost of the power as supplied and the value of the coal which would be used in generating an equal amount. Where the rate charged per kilowatt-hour is high, and the coal which may be burned at the colliery in making steam is of a low grade, possessing but a small market value, the choice would naturally go against the central power company. If, on the other hand, the outside company can furnish power at a moderate or low rate, and the output of the mine possesses a good market value, no sensible mine operator will insist upon manufacturing his own current.

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Concrete Underground

The employment of concrete or reinforced concrete underground is on the increase. It has not yet, however, in this country, at least, assumed such an importance as to be a serious competitor of wood.

Although utilized to a considerable degree for the building of stoppings and overcasts, concrete in mines is not used to the extent that engineers who work only above ground might anticipate, for, although almost ideal for supporting tender roofs on haulage roads, the necessary centering and the supports sustaining the same, for a considerable period of time, necessarily block the haulageway upon which they are placed. In many instances, this fact alone precludes the employment of concrete underground.

The many and varied methods of using wood have been so successful, that operators in general are loath to adopt any substitute, the utility and adaptability of which have

not been thoroughly proved. To the actual miner, the use of timber has become almost second nature and he distrusts any change introducing marked variations in his daily routine as being either useless or unnecessary.

It is possible that, although perhaps concrete may never be a strong rival of timber for room props and similar purposes, it may become a serious competitor of steel timbering on road and haulageways, where it is desirable to make the roof support of a permanent or semi-permanent nature. Reinforced-concrete posts and beams either made separately or cast *en bloc,* possess all the advantages of the steel timbering and require no painting or other protection from dampness.

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The West Virginia Strike

Governor Hatfield, of West Virginia, will have performed a great service to the coal industry in general, and to the State of West Virginia in particular, if he succeeds in settling the bitter dispute between the operators and miners of his commonwealth. Industrial history affords no more prolonged, cruel fight than has been carried on during the last year in the southern coal fields of West Virginia.

Both factions in the controversy have been virulent in their campaign; both sides have been partly wrong and partly right. Many of the operators interested in this particular field have failed to keep pace with the advances in commercial industrialism. They have wielded their power in a thoughtless, selfish manner, often extracting the maximum of service and forcing the minimum reward.

For years a few of these same operators have held the whip hand and have successfully fought down every rebellion on the part of their employees. The country affected is not easily accessible and has practically no large towns so that physical conditions favor the establishment of company stores, which latter have been frequently operated in a manner unfair to the men. Time was not so far back when a miner who was not a good spender at the company's store was discharged, and his place filled by someone less careful in the matter of handling his hard-earned wages.

Such actions as this on the part of a few coal companies aggravated the acute labor situation of the field to the breaking point, and the more humane operators of the district have paid a fearful price for the shortsighted policy of their less wise breathren.

If in future contests between labor and capital in the coal industry the miners become masters of the situation and base their subsequent conduct on the idea that might should prevail rather than right or reason, some operators will have to concede that they themselves were the exponents of such a creed, and that the men are only following the example laid down by their worthy teachers. No man should whimper at having to take some of the same medicine he has forced down the throats of others.

A great many miners are mean and selfish, seeking to force concessions from their employers without regard to justice or legal procedure. Contracts have been violated knowingly by the union officials and wage agreements have, and are, today being disregarded with impunity. However, this unfortunate condition does not furnish a justification for employers to condemn labor organizations as a whole, any more than moral laxity on the part of one individual is sufficient cause for a general condemnation of the whole human race.

Every movement, whether industrial or social, if it is to succeed, must be built on a foundation of truth and honesty. The day is near when crooked labor leaders will be as popular with their men as a cholera patient at a social tea. On the other hand, it is quite possible that the very union so many coal operators have been fighting, will eventually prove the bulwark of their defense against such dangerous anarchistic bodies as the Industrial Workers of the World, which have already, and will again, try to gain control of the miners' union.

Only a short time ago the great railroads of America were crying out bitterly against the strictures placed on their business by our federal government. A few days ago this same government appeared before our Supreme Court as the champion of the roads in an appeal against the destructive attacks of individual states. Surely times do change.

The coal industry has enough outside enemies to keep it busy. Why can we not have peace within the family? Let us encourage the union to select honest, capable leaders who will fight to the "drop of the hat" for what they consider "fair rights of the men," but who will insist that every miner strictly observe his bargain, once a contract is made, just the same as the operator is supposed to do. No other plan is fair or right, and what is not fair and honest cannot permanently succeed.

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Conservation and the Consumer

During recent years we have all heard much from the public platform and popular press concerning the conservation of our natural resources. Almost without exception this expression refers to coal in the ground, natural gas either in the earth or as it issues therefrom, mineral oil in a position similar to that of the gas above described, and standing timber in the forest.

Up to the present time, regardless of what efforts have been made toward saving for future generations what might truthfully be termed the nation's birthright, no legislator has been bold enough to advocate compulsory utilization of fuel-saving apparatus by the consumer. No would-be stateman has yet unlimbered his oratorical artillery in condemnation of the pernicious waste of heat in the furnaces of antiquated and inefficient steam boilers, with which the country is all too generously dotted.

The public in general is quick to criticize the producer of the world's fuel and clamor for drastic legislation governing the mining industry. These same people evidently forget the little cook stoves in their own kitchens which utilize in actual cooking perhaps 2 or 3 per cent. of the heat evolved in the combustion of the fuel and spill the balance up the chimney in the form of hot air and gas.

It is safe to say that the small consumers of the country by employing obsolete and extravagant methods of fuel burning and heat utilization annually waste amounts of coal which in actual cash value vastly exceeds that left in the ground impossible of recovery.

The conservation of natural resources is a laudable ambition and one worthy of strong commendation. Like most other great reforms, however, its practice should begin at home.

Dangers of Taking Powder Home

By H. G. Cockill*

The picture published herewith shows a house owned by the Knickerbocker Smokeless Coal Co., at Knickerbocker No. 2 mine, Hooversville, Penn., which was blown up Mar. 9, 1913, by a keg of powder.

Mike Truckley, a Slav, preparing for work with four other boarders at 5 a.m., went into the cellar to get powder for his day's work. He stepped near the red-hot stove in order to see more clearly and began pouring the powder into his cadger. The dust of the powder blew onto the stove and the flame passed back into the keg, which exploded with great violence.

Showing Result of Powder Explosion in Miner's Home

The explosion broke the 10-in. concrete walls and completely demolished the building. Four open kegs of powder standing near-by were untouched by the explosion. Mike's sister and her child were at the door upstairs and had to be taken down over the ladder shown in the picture, as the stairs were blown down. They escaped unharmed. Two porches of the house were blown a distance of 20 ft. The injured man, Mike Truckley, was removed to the Johnstown Hospital, where he died two weeks later.

Our Front Cover This Week

The photograph on the front cover of this week's issue of Coal Age shows a No. A-1 ½-C-3 electric rotary drill in operation in mine of the New Pittsburgh Coal Co., Murray City, Ohio. This drill has met with considerable favor in bituminous mines because of its extreme simplicity. It may be readily handled by one man and is easily moved or set in position for drilling. Although especially designed for drilling coal, it can be used for drilling slate, shale, rocksalt, clay and gypsum. The drill is manufactured under patents owned by the Jeffrey Mfg. Co.

*Mining engineer, Knickerbocker Smokeless Coal Co., Hooversville, Penn.

The Shot Blew Through

By J. R. Allardyce

(Written expressly for "Coal Age.")

Old Tony Marconi, the Dago,
In the face of his room drilled a hole;
Says he, with a grin,
"I put powder in,
An' play helly-fire wi' da coal."

So he gave it six feet of a charge
And tamp'd it up tight as a gun;
Says he, "I come back
When he giva da crack,
An' maka da big pile o' mon!"

So he lit up the fuse and decamped,
To wait for the roar and the crash;
And munch'd at his ease
His garlic and cheese,
And reckon'd his labors in cash.

When the smoke rolled away from the face,
He crept back elate to the job;
But Tony felt punk
When he found not a chunk,
And he sat down and wept in the gob.

"Cara mia!" said he, "but I hear
Da big crack, an' I smella da smoke;
But I no see no coal,
An' da tamp in da hole—
Sancto Pietro! he no even broke."

And he quit the whole job in disgust,
While old Squeaky Pete with delight,
Loaded coal in the cars
Till he blink'd and saw stars,
From the shot that blew through on the right.

Mining Meetings

The meeting of the committeemen at the Pittsburgh Experimental Station of the Bureau of Mines, which was scheduled for Apr. 7, has been postponed. The object of the meeting was to make provision for the organization of the American Mine Safety Association. It is the desire to organize the 15,000 men scattered throughout the United States, who have qualified as first-aid men into a compact body.

The idea is to model this organization after the far-famed St. John's Ambulance Association of Great Britain. The first step necessary is to have the members of the American Safety Association solidify the widely scattered local branches of that institution. So few of the members of the committee were present on Apr. 7, that it was decided to postpone the meeting until such time as would be most convenient for those concerned.

The presence of blackdamp, a mixture of carbon dioxide and nitrogen, will often neutralize the effect of firedamp on a flame. Analyses of mine gases which gave only a faint cap when tested with a safety lamp, have shown 4 per cent. of methane mixed with blackdamp. When testing with a lamp, remember that the flame is not as clear in those that have burned some time in a dusty atmosphere as in lamps which have burned but a short time in clear air.

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 5—The unique suggestion of COAL AGE, that textbooks should be allowed students in examination, is a striking commentary on the system of mining education today. How true it is that system makes or mars the man. Favorable results, however, are often attained, despite the system employed; and when the results are otherwise, the system is more to be blamed, perhaps, than the capacity of the student. I have seen excellent work accomplished by a system confined to certain limits when the slightest deviation from the beaten track would produce confusion and disaster. Most unacademic systems err in their neglect of the study of principles, and this, even with the approbation of boards of education.

What, after all, is education but a knowledge of principles and their application. Therein lies the crucial test of any system. If the student is not enabled to grasp fundamentals and use them in the development or transposition of formulas, in the solution of problems, upon what does the system as a means of education rest? Here is where the function of examination lies—not in scrutinizing the mechanical results, to produce which the tools have been provided; but to ascertain, if possible, the extent of the pupil's mastery of principles and his ability to apply them efficiently in practice.

I would like to ask what is a man's efficiency, in a special branch of education, if his results are obtained by the mechanical handling of a ready-made formula? Would there be any obstacles to his acquiring the reputation of an "admirable Crichton," with accommodating textbooks at his elbow and a minimum of study and grind to his credit? What is my knowledge of the steam engine worth if it consists only in ability to substitute numerical values for the symbols in the formula

$$H = \frac{plan}{33{,}000}$$

Or, what is my conception of the mathematical relation of the sides of a right-angled triangle to one another, if it is determined by the mechanical substitution of figures in variations of the formula

$$Base = \sqrt{hyp.^2 - perp.^2}$$

No! Let us take the bull by the horns and, admitting the defects of method in our systems of teaching and taking a dose of Bacon or Descartes as a stimulant to our efforts, settle down to the production of something that will simplify instruction and yet provide a basis for a system that shall efficiently teach the essentials of the education needed in coal mining.

J. R. ALLARDYCE.

Saginaw, Mich.

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Letter No. 6—The education of the miner is a large subject to discuss. I believe every miner ought to be educated—at least he should have a common-school education; but I cannot see how we are going to educate the miners unless we start with the boys. I believe every boy ought to be compelled to attend school until he graduates from the high school. He will then have a start in life and if he has any ambition he can advance himself in any line.

On the other hand, if a boy is compelled to work about the mines at the ages of twelve and fourteen, he will lose all ambition to study and will not realize what he has lost until later in life. He is then ashamed to start back with the boys, and continues in the same old rut as his father did before him. To avoid this embarrassment every boy should be compelled to attend school till he completes the high-school course, as the miner needs education as well as any other class of men, so that if there is any chance for his advancement he will be capable of filling a higher position.

In coal mining, there is not a greater drawback than to be without an education; but if we educate the miner who is going to mine the coal? The educated man is not going to mine coal. And again a miner cannot educate his family on the average wage of $50.00 a month. I believe we will have to educate somebody higher than the miner and have them take more interest in educating the mine workers who cannot educate themselves. The great cry in the anthracite region of Pennsylvania is, "We must educate the miner." But the great trouble is that those who have been educated seem to get above their fellowmen and forget that they ever worked as common miners. We should educate the mine officials to get nearer to their men, and then we can do something towards educating the miner. I say, however, educate the miner by all means.

MINER.

Scranton, Penn.

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Letter No. 7—Owing to the failure of the state legislature of Washington to pass legislation on the new code of mine laws drawn up by the commission appointed by Governor Hay, who retired from office, Jan. 1, 1913, the state of Washington is deprived of the advantage to be gained by a new code of mine laws, for another two years. As I have stated in a previous article, in COAL AGE, the present law does not require a man to hold a certificate of competency in order to serve either as mine foreman or fireboss. The Northwestern Improvement Co., the largest and most progressive coal company in the state, does, however, require that in order to hold either of these positions, a man must have a certificate which is issued by the company, and examinations for such certificates are held by this company twice a year.

At the last examination, which was held during the fore part of the present month, the same method was pursued as in the previous examinations. The applicants for fireboss were given ten questions to answer in writing with a total marking of 50 per cent. Later, they were taken to a certain entry, in a mine in which the ventilating system had been disarranged, props knocked out and

others set wrong, drop sheets misplaced, and in several places small quantities of marsh gas (CH_4) could be found. Throughout this territory, experienced and competent men were stationed to watch the men as they made their inspections.

The candidates were stationed on the main parting under the inspection of a competent man, and when all was ready, they were started in, at intervals of ten minutes. When they had completed their inspection, each candidate was required to make a written report of the conditions as he found them; and this report was compared with the report of the inspectors, and the candidate given a mark, according to the following schedule:

	Points
Handling and testing of safety lamps	10
Drop sheets and ventilation	10
Gas in all places	10
Timbering	10
General deportment	10
Total	50

I have always been an advocate of allowing candidates the use of textbooks in these examinations, as long as the questions asked do not give the applicant a direct chance to copy, although by so doing the candidate would cheat no one but himself. In conducting the last two examinations held by the Northwestern Improvement Co., I found that several good men would have failed to pass the examination had I not allowed them the use of textbooks to find the formulas for certain questions asked. Knowing these men from having been connected with them in their work around the mine, I am satisfied that they will make much better mine foremen than the younger men who have studied hard to memorize all the formulas, and who have had some engineering experience, but who still lack the necessary practical experience in mining.

It has also been my experience that men who have studied hard previous to taking an examination, in order that they might memorize the formulas, constants and other data, after securing a position as foreman, forget these formulas and data and refer at once to their textbooks whenever obliged to make calculations that will enable them to contend successfully with the various difficulties that occur in daily mining practice.

FRANK GOOD.

Roslyn, Wash.

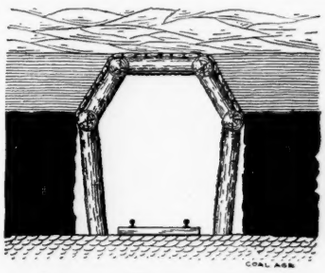
Waste of Mine Timber

The recent discussion on post timbering at the working face has called my attention to the large and in most cases unwarranted waste of timber in and around coal mines. This waste of timber is probably greater in mining than in any other industry. The unnecessary waste of timber can be greatly reduced; at the same time, the necessary waste portions can often be put to some good use, if the mine officials will give the matter proper attention. Greater consideration is given this matter in foreign countries than in America, because they have come to realize the necessity for so doing. As civilization advances and the population increases, suitable timber naturally becomes more scarce and higher in price and, for this reason, the practice of economy in its use is essential.

It is important to give all mine timber a careful inspection when it is received at the mine, as without this inspection much timber will be received that cannot be used and must be thrown aside. It is likewise important to give careful attention to the framing of timbers and avoid waste, as far as possible, by cutting down posts that are too large for the purpose. Much timber is lost in abandoned places, that could be used again if proper care be taken to recover and send it where it can be used.

Again, it is important that timber should be cut at the right time of the year and stored so that it will become seasoned. The life of mine timber is greatly increased by treating timber so as to preserve it from decay. Wood continually deteriorates under the stresses or loads to which it is subjected, and these ill effects are greatly increased by the conditions of moisture and temperature so common in mining.

Proper care should be used in placing timber, in order to secure the best service and prolong its life. In rooms, a systematic method of timbering is generally the safest plan to follow. Special conditions require special forms of framing. When mining under a week drawslate, and it is desired to maintain a permanent haulage road, it may be advisable to adopt a style of timbering similar to that shown in the accompanying sketch. In this system four longitudinal stringers are supported by two legs, two struts and a short collar or crossbar at the top. As shown in the figure, the legs of the timber frame are given a slight inclination inward, at the bottom, so as to better support the side thrust of the drawslate above the coal. The upper portion of the frame forms an arch and is lagged, as shown in the sketch. In special cases, where the roof has a tendency to cave high, it may be advisable to omit the collar, or crossbar, and extend the side struts as rafters until they meet a single stringer in the roof, which gives greater head room.



ARCHED TIMBER FRAME

Much timber can be saved by the miners and daymen engaged on pillar work, exercising suitable precaution. It often pays to set a couple of temporary props to save one timber that would otherwise be abandoned. Machines for drawing timbers are used to advantage by many companies. Much timber is lost through neglect. It is common to find posts that have been taken to working places and never used. A visit to most abandoned places will reveal many posts that should have been drawn and other timber covered by falls. It is common to find ties, wooden rails, brattice boards, etc., scattered through air courses and going to waste, because they have not been cleaned up and taken to where they could be used. Miners will often order timber sent in rather than gather the loose timber lying in the waste and left along the rib. Care should be taken to see that miners order the proper length of timber required, to avoid the waste of cutting long timbers where a shorter stick is needed.

For permanent work, when possible, steel and reinforced concrete should be used, as they have greater strength and longer life. Tile, brick or concrete stoppings, and overcasts are generally tighter and safer than those built of wood. The use of steel mine ties, in rooms and airways, will generally be found to be of advantage.

MINING ENGINEER.

Clarksburg, W. Va.

System in Timbering

It is both economical and advantageous to adopt a uniform and special method of timbering that will be suited to the particular conditions in a mine. The weight is thereby more evenly distributed over the coal face and the timber is more promptly set by the miners, because the system demands that another row of timbers must be stood at the specified distance from the face of the coal and the back timbers drawn regularly as the working face advances. If the miner fails to do this at the time, his neglect is observed by the foreman or his assistant on his first round and he is ordered to cease work on the coal till he has done the timbering as required by the regulations of the mine.

In my opinion, the miner should be held responsible for the timbering of his own working place as it advances. I believe this is a safer method to adopt than to employ a special timberman, because the miner working every day in the same place is more apt to note the changing conditions of the roof than the mine foreman or timberman, who spend but a portion of their time in one place and visit, perhaps, a hundred different working places, in the same shift. The miner should be supplied with plenty of timber of the right length so that he will have no excuse for not setting the same promptly, as the face advances.

Since the miner is not a proper judge of all the conditions that should determine where timbers ought to be placed, it is all the more important that he be required to set the timbers at the face according to some regular order or system. This system should be determined by the conditions and nature of the overlying and underlying strata; the thickness and nature of the coal; the depth below the surface; the pitch or inclination of the seam; and the method of mining the coal. When these conditions change, it will be necessary to change or modify the system of timbering, and the miner should be given proper instructions at such time.

But, after all has been said, in favor of systematic timbering, I believe that the method adopted for the working of the coal—the width of the openings and the size of pillars required is more important than even the adoption of a proper system of timbering. It must be remembered that timbering, at the working face, is only for the purpose of securing loose pieces of slate or roof against falling and to give the miner warning of impending danger and more evenly distribute the weight upon the pillars and the face of the coal. If the thickness of the pillars is too small and not made proportionate to the width of the opening, no amount of timber or system of timbering will avail to correct the evil.

BENJAMIN HARTILL.

Johnstown, Penn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

MINE GASES

The gases of most importance in coal mining, together with their chemical symbols, molecular weights, densities referred to hydrogen and specific gravities referred to air of the same temperature and pressure, are the following:

Gas	Symbols	Molecular Weights	Density H=1	Spec. Gravity Air=1
Methane (marsh gas)	CH_4	16	8	0.559
Olefiant gas	C_2H_4	28	14	0.978
Ethane	C_2H_6	30	15	1.0366
Carbon monoxide	CO	28	14	0.967
Carbon dioxide	CO_2	44	22	1.529
Hydrogen sulphide	H_2S	34	17	1.1912
Oxygen	O_2	32	16	1.1056
Nitrogen	N_2	28	14	0.9713
Hydrogen	H_2	2	1	0.06926

Occurrence of Mine Gases—Aside from the oxygen and nitrogen of the air, the gases commonly occurring in coal mines are methane, carbon dioxide, carbon monoxide, and less frequently or in less quantity, hydrogen sulphide and olefiant gas. These gases are produced by the processes of decomposition or combustion constantly going on in the mine, or they emanate from the coal or other strata, where they exist as natural gases.

Occluded Gases—The gases commonly occluded in the coal formations are methane, ethane, nitrogen, carbon dioxide and oxygen. They are the result of the chemical changes that took place in the formation of the coal; or are produced by the action of acid waters on certain limestones or other carbonates. Occluded gases are held in the pores of the coal and other strata, from which they drain into the mine openings, or work upward through such pervious strata as shale and sandstone. The process is called "emission" or "transpiration" of gases.

Pressure of Occluded Gas—At times, the gas is confined in the coal or other strata by an overlying stratum of clay or impervious limerock that prevents its escape to the surface, and the presure of the gas is then often very great, varying from 500 and 600 lb. per sq.in. to four or five times that amount. This presure is manifested in different ways. As the mine workings are extended the flow of gas into the mine increases with the exposure of fresh faces of coal, except where the conditions are such as to allow the gas to drain off and reach the surface.

Effect of Faults—Fault lines and other geological disturbances of the strata have opened channels by which the gas confined in certain strata escape to other strata or into the mine workings or to the surface. For this reason, the near approach of the working face to a fault line or a disturbed condition of the strata is often accompanied by a marked change in the gaseous condition of the mine air. The percentage of gas common to the mine may then either increase or decrease depending on the location of the gas and the nature of the fault.

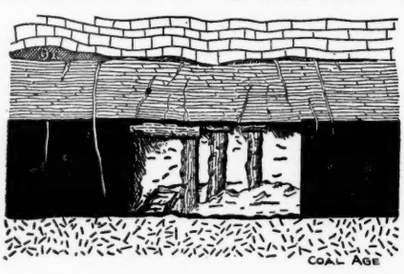
The Coal Age Pocket Book

Gas Feeders, Blowers—Any continuous flow of gas from a crack or crevice in the strata is called a "gas feeder," or simply a "feeder." The gas flowing from the crevice is known as "feeder gas."

When a gas feeder is under high pressure so that the gas issues with considerable velocity, the feeder is called a "blower" and the gas "blower gas."

Effect of Gas Pressure in Mining—The pressure of gas confined in the coal is often sufficient to splinter the coal in its effort to escape, the fine coal being thrown into the face of the miner at work. At times, the gas escapes from the coal with a peculiar hissing sound known as the "singing of the coal." The presure of gas in the roof frequently causes heavy roof falls, and gas in the floor causes the bottom to heave. In some instances, the gas pressure assists the extraction of the coal and lessens the work of the miner by helping to break down the coal.

Outbursts of Gas—In the mining of gaseous seams, it is not uncommon for gas to work in the strata as the coal is extracted. As a result, the gas often accumulates in pockets as shown in the accompanying figure. The settlement of the roof incident to the removal of the coal affords opportunity for the gas to expand and work forward toward the opening. The working of the gas in the strata is often accompanied by severe "poundings" or "bumps," due to sudden displacement of the gas. Such sounds often continue for several days previous to a sudden outburst of the gas into the mine workings. The continuance of these poundings are a sufficient warning to experienced miners to vacate that part of the mine till the strata have become more quiet by the gradual draining off of some of the gas.



SHOWING THE ACCUMULATION OF GAS IN POCKETS IN THE STRATA

In many cases, where the gas works down into the coal, either at the face or in the "ribs," as shown in the figure above, the pressure of the gas becomes distributed over a considerable surface, and is sufficiently great to throw down the coal. This is called an "outburst" of gas, since large volumes of gas and often hundreds of tons of coal are thrown violently into the opening.

INQUIRIES OF GENERAL INTEREST

Effect of Carbon Dioxide on Life and Flame

(a) What per cent. of carbon dioxide (CO_2) will cause a miner to notice that he is working in bad air? (b) What per cent. will ordinarily cause him to stop work? (c) What per cent. will cause unconsciousness, say after a half hour's work? (d) What per cent. will extinguish a miner's open lamp?

M. C. BUTLER.

Fairfax, Wash.

(a) The effect of carbon dioxide on the human system is not alone dependent on the percentage of this gas present, as the effect of the gas, both on life and flame, is greatly increased by the depletion of the oxygen in the air. Careful experiment has shown that when carbon dioxide is added to pure air, respiration becomes noticeably more difficult when the proportion of the gas in the air exceeeds 4 per cent. If there is 4 per cent. of carbon dioxide present, the proportion of pure air in the mixture is $100 - 4 = 96$ per cent.; and since oxygen forms 20.9 per cent. of the pure air before the carbon dioxide is added, the proportion of oxygen present in this mixture is $0.209 \times 96 = 20.064$ per cent. In this case, therefore, the oxygen has only been depleted, by the addition of carbon dioxide, from 20.9 to 20.064 per cent.; but the presence of the 4 per cent. of carbon dioxide begins to make respiration difficult.

(b) No percentage can be stated as producing such effect as will cause a man to stop work owing to the presence of carbon dioxide in the mine air. The effect is greatly modified by the physical condition of the person, the character of work he is doing and the temperature of the air and amount of moisture present. All of these conditions greatly modify the effects of the gas on the system. As respiration becomes more difficult owing to the increasing percentages of the gas in the air, headache and nausea are produced. Some men are stronger and better able to withstand these effects and continue work longer than others; but, in general, from 6 to 8 per cent. of this gas present in the mine air may be considered sufficient to produce effects that will cause the ordinary miner to stop his work.

(c) The answer to this question must be modified by the same conditions we have just mentioned. For this reason, it can only be stated, in a general way, that from 10 to 14 per cent. of carbon dioxide present in the mine air may produce unconsciousness when breathed for one-half hour while at work.

(d) The depletion of the oxygen in the mine air increases the effect of carbon dioxide on the flame of the lamp to a much greater extent than it modifies the effect of this gas on the human system. For example, a lamp placed in a closed place, as under a bell-jar, and allowed to burn until it is extinguished, consumes some of the oxygen of the air and produces, at the same time, carbon dioxide. The depletion of the oxygen of the air and the percentage of carbon dioxide produced, at the moment the lamp is extinguished, are found to vary with the nature of the flame. A candle is extinguished when 3.2 per cent. of carbon dioxide is present and the oxygen of the air is depleted to 15.7 per cent. A lamp burning paraffin oil is extinguished when 3.0 per cent. of carbon dioxide is produced, the oxygen of the air being depleted to 16.6 per cent. The atmosphere remaining when the lamp is extinguished is called a residual atmosphere.

On the other hand, an artificial atmosphere, produced by adding carbon dioxide to pure air, will extinguish a candle flame when 13.4 per cent. of carbon dioxide is present, the oxygen being then depleted to 18.1 per cent. In like manner, an artificial atmosphere, produced by adding carbon dioxide to pure air, has been found to extinguish an oil lamp when 14.3 per cent. of carbon dioxide is present, the oxygen of the air being depleted to 17.9 per cent.

Owing to the free circulation of air in the mine, the mine air must be considered as more nearly approaching an artificial atmosphere than a residual atmosphere. It is true, however, that in portions of the mine workings that are poorly ventilated, the oxygen of the air has not been replenished as rapidly as it has been consumed and, in this case, a slightly less percentage of carbon dioxide present in the air will suffice to extinguish the lamp. Although 18 per cent. of carbon dioxide in air, under ordinary conditions, is stated as producing a *fatal* atmosphere while an oil lamp may be extinguished in air containing only 14 per cent., it is never safe to remain in an atmosphere where a lamp is extinguished. Less than 4 per cent. of carbon dioxide present in the mine air will cause the lamps to burn dim and this should warn men to seek better air.

Heat Absorbed by Air

How many B.t.u. will be required to raise the temperature of 100,000 cu.ft. of air from 35 to 54 deg. F.?

FIREBOSS.

Monongahela, Penn.

The first step is to find the weight of 100,000 cu.ft. of air at the given temperature (35° F.), assuming a barometric pressure of, say 30 in. of mercury. Thus,

$$100{,}000 \left(\frac{1.3273 \times 30}{460 + 35}\right) = 8044 \text{ } lb.$$

Now, assume that the pressure remains constant and the air is allowed to expand freely under the stated rise of temperature. The specific heat of air, for constant pressure, being 0.2374, the heat absorbed by 1 lb. of air for each degree the temperature rises, is 0.2374 B.t.u. The rise of temperature, in this case, is $54 - 35 = 19$ deg. The total heat absorbed in producing the rise of temperature, or the heat required to raise the temperature of 100,000 cu.ft. of dry air, under constant pressure, from 35 deg. to 54 deg. F., is

$$8044 \times 19 \times 0.2374 = 36{,}280 \text{ } B.t.u.$$

EXAMINATION QUESTIONS

Mensuration and Surveying

(*Answered by Request*)

Ques.—A certain entry is driven 9 ft. wide on the bottom, 7 ft. wide on the top and 6 ft. high, its section being in the form of a trapezoid. If this entry is half full of water—that is to say, contains half the water that it would hold if full, what is the depth of the water standing in the entry, and what is the width of the entry measured at the surface of the water?

Ans.—The area of a trapezoid is found by multiplying one-half the sum of its two parallel sides by the perpendicular distance between them; thus,

$$area = 6\left(\frac{7+9}{2}\right) = 48\ sq.ft.$$

One-half of this area, or 24 sq.ft., is the area of the cross-section of the water.

Now, observe that the width of this entry decreases 2 ft. in 6 ft. of vertical height. Therefore, calling the depth of the water x, the decrease in the width of the entry at the surface of the water will be $\frac{2}{6}$ or $\frac{1}{3}$ of x, making the width at the surface of the water $9 - \frac{1}{3}x$. The sum of the two widths measured at the bottom and at the surface of the water is then $9 + 9 - \frac{1}{3}x = 18 - \frac{1}{3}x$; and the half sum of these widths is $9 - \frac{1}{6}x$. Then, multiplying this half sum by the depth of the water x, we have for the area of the cross-section of the water

$$x\left(9 - \frac{x}{6}\right) = 9x - \frac{x^2}{6}$$

But since this area must equal 24 sq.ft., the value of x is found by solving the equation:

$$9x - \frac{x^2}{6} = 24$$

Or, multiplying through by 6 to clear of fractions, and changing the signs of all the terms, and writing x^2 first we have

$$x^2 - 54x = -144$$

Now, complete the square in the first member by adding to it the square of half the coefficient of x; or $27^2 = 729$; remembering that the same amount must be added to both sides of the equation, to preserve the equality; we have

$$x^2 - 54x + 729 = 729 - 144$$
$$x^2 - 54x + 27^2 = 585$$

The first member of this equation is now a perfect square, its square root being $x - 27$; hence, extracting the square root of each member, we have

$$x - 27 = \pm\sqrt{585} = \pm 24.187$$
$$x = 27 - 24.187 = 2.813\ ft.$$

The depth of the water is, therefore, 2.813 ft.; and the width of the entry at the surface of the water is

$$9 - \frac{x}{3} = 9 - \frac{2.813}{3} = 9 - 0.938 = 8.062\ ft.$$

Ques.—An entry measures 9 ft. on the bottom, 6 ft. at the top and is 5 ft. high. Find the depth of the water when the entry is half full.

Ans.—The area of this entry is $5\ (6 + 9) \div 2 = 37.5$ sq.ft. Since the width of the entry decreases 3 ft. in 5 ft. vertical height, and calling the depth of the water x, the decrease in width, at the surface of the water, is $^3/_5$ of $x = 0.6x$, making the width at the surface of the water $9 - 0.6x$, and the sectional area of the water

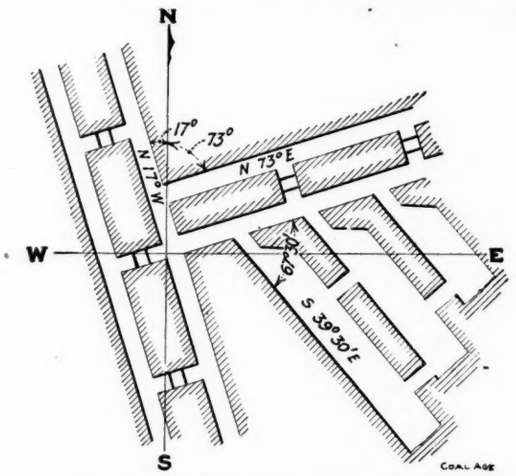
$$Area = x \times \tfrac{1}{2}\ (9 + 9 - 0.6x) = x\ (9 - 0.3x) = 9x - 0.3x^2$$

The area of the water being $37.5 \div 2 = 18.75$ sq.ft., we have

$$9x - 0.3x^2 = 18.75$$
$$x^2 - 30x = -62.5$$
$$x^2 - 30x + 15^2 = 225 - 62.5 = 162.5$$
$$x - 15 = \pm\sqrt{162.5} = \pm 12.75$$
$$x = 15 - 12.75 = 2.25\ ft.$$

Ques.—The course of the main entry in a certain mine is N 17° W: (a) What is the course of a cross-entry turned to the right at an angle of 90 deg.? (b) What is the course of the rooms turned off the cross-entry at an angle of 67° 30′ to the right?

Ans.—As shown in Fig. 2, the main entry makes an angle of 17 deg. to the left of the meridian and since the



PLAN OF MAIN AND CROSS-ENTRIES, SHOWING ROOMS

cross-entry is turned off at any angle of 90 deg. to the right of the main entry, it makes an angle of $90 - 17 = 73$ deg. to the right of the meridian. The bearing of the cross-entry is, therefore, N 73° E.

(b) Since the rooms are turned to the right of the cross-entry an angle of 67° 30′, the total angle measured from the north end of the meridian around the right, to the center line of the rooms is $73° + 67° 30' = 140° 30'$. Since this angle is greater than 90 deg., the bearing of the rooms lies in the southeast quadrant. The angle of this bearing is measured from the south end of the meridian, and is $180° - 140° 30' = 39° 30'$. The bearing of the rooms is, therefore, S 39° 30′ E.

COAL AND COKE NEWS

Washington, D. C.

Attorney-General McReynolds has developed a plan to govern the future administration of the Sherman act which, it is believed, may operate to change in some important particulars the present method of applying that law and would incidentally alter the mode of proceeding in the so called coal cases.

Mr. McReynolds' idea is to have the local federal legal authorities, instead of waiting for an elaborate investigation to be made by the Department of Justice, and instead of waiting for instructions from Washington, take action in all instances where they are advised that local violations of the Sherman act are being committed.

If this plan were to be followed, the effect would be that proceedings under the Sherman law would be rendered much more numerous and the amount of difficulty caused to those subject to prosecution would probably be largely increased.

Demand Coal Be Kept Dutiable

It is being unofficially stated that a strong demand is to be made by coal interests which are powerful in Congress for a restoration of rates of duty to some extent, or at all events for the insertion in the new law of a provision removing the duties on Canadian coal only in the event that Canada gives equally good treatment to America. This, however, is likely to be sharply rebutted by the New England manufacturers who have been feeling all along that they were being given but little consideration and who have recognized help for themselves in a small group of items used by them in the process of production and considerably reduced under the tariff bill or placed on the free list.

One of these was coal and there has been a strong disposition to regard the treatment of it in the act as nothing more than a bare recognition of their claims for something offsetting the heavy reductions on their goods which were carried in the act. It is therefore likely that a sharp struggle will occur before the dutiable status of coal will be altered.

Must Become Parties to the Government

According to information received by the Department of Justice it will be necessary for J. P. Morgan & Co. and the Central Trust Co., of New York, to become parties to the case of the Government against the combination of railroad and coal operators in which the Lake Shore & Michigan Southern, the Hocking Valley, and the Sunday Creek Coal Co. were involved.

This has now been held to be a trust in violation of the Sherman law under a decision of the Federal Circuit Court of Appeals at Cincinnati, Ohio. The decision holds that all persons interested in the stock of the coal company and all those holding property who are pledged to secure the dividing of the coal traffic moving over the roads in question shall be made parties to the suit of the Government. This involves the New York interests already referred to.

Coal in Our Export Trade

The Department of Commerce has compiled an analysis of the export trade of the United States which shows that ten countries take the bulk, or about three-fourths, of United States exports and among these considerable attention is given to coal and coke.

England is first in the list of countries and Canada second while in Canada's receipts of goods from the United States coal and coke rank second in value with $43,000,000. Germany is third in the list, France fourth, Netherlands fifth, Italy sixth, Cuba seventh and in Cuba's receipts coal ranks fifth with $3,000,000.

Mexico follows Cuba as eighth in the list, her receipts of coal from the United States being the seventh article of importance and amounting to about $1,500,000 annually. Japan is ninth and Argentina tenth, bituminous coal received by the latter from the United States amounting to $500,000 yearly.

Mining Institutes and Vocational Schools

According to the data which have been made public in regard to the mining institutes and vocational schools in the anthracite regions of Pennsylvania, the past season has been decidedly successful. Institutes were held at Wilkes-Barre, Scranton, Pittston, Lansford, Hazleton, Nanticoke, Shamokin, Mt. Carmel and Carbondale.

At present there are about 100 different positions in and about the mines for which special training is advisable or indispensable. In order to avoid embarrassing adult miners who dislike to show ignorance or enter classes with children the present method is to have the classes at night for men only. These have been held either three or five nights a week according to the disposition of the miners to attend.

The strong interest in the work has been quite acceptable to the mine operators as they believe it tends to bring about more efficient work and closer attention to duty on the part of the employees. Some of the coal roads have contributed largely to the expenses of the undertaking.

The President Will Not Interfere

The present understanding is that President Wilson will pursue the policy of not interfering with the men at the head of the scientific bureaus of the Government, and that in pursuance of this policy he probably will not make any changes in the Bureau of Mines or Geological Survey.

The action taken in removing the head of the Census Bureau was based on the belief that that institution had not been efficiently conducted and, curiously enough, it would seem that one of the most severe criticisms made with reference to it relates to the way in which it carried on the census of mines, particularly coal, this, however, being jointly managed by the census and the Geological Survey. There seems to be general approval for the policy of non-interference with the scientific bureaus of the Government.

PENNSYLVANIA

Anthracite

Hazelton—A recent strike of the mine workers at a colliery of the Lehigh & Wilkes-Barre Coal Co. has extended to all the operations of the corporation. Eighteen hundred men are idle. The strike was caused by the question of the wearing of union buttons.

Wilkes-Barre—Four men were killed and two fatally injured by an explosion of gas in the East Cooper slope of the Woodward mine of the Delaware, Lackawanna & Western Co. at Edwardsville, Apr. 12. Several others received burns and lesser injuries. A naked light was the cause of the explosion.

Scranton—Fire slightly damaged the breaker of the Diamond mine of the Lackawanna Coal Co. in West Scranton. The fire started in the loading shed of the building, and a serious blaze which might have destroyed the breaker was prevented by the timely discovery of the fire by two workmen employed about the breaker.

Fire believed to have been caused by children playing with matches nearly destroyed the old Mt. Pleasant washery of the Lackawanna Coal Co. at the West end of the Mulberry Street viaduct, in Scranton. The washery had been abandoned some time and was of little value.

Bituminous

Pittsburgh—Striking calkers and woodworkers employed at the marine ways of the Monongahela River Consolidated Coal & Coke Co. have been ordered to return to work or remove their tools. The striking men are demanding an increase in wages. They claim that the company has refused to meet their grievance committee.

Yatesboro—Miners in this vicinity are said to be on strike owing to trouble which has arisen concerning the method of weighing.

Greensburg—The commissioners of Westmoreland County have recently fixed valuations for various coal lands for taxable purposes.

WEST VIRGINIA

Charleston—Governor Hatfield has served notice that he will arrest all persons who are caught, aiding in any way, insurrection in West Virginia.

The coal operators of Kanawha County have accepted the governor's proposal for a settlement of the miner's strike.

The miners' representatives, however, have not yet answered. It is said that the New River operators also have made peace.

A movement has been started by the United Mine Workers of America to help the miners and their families, who suffered during the recent floods. A committee has been going the rounds in this vicinity to see how many need assistance.

Morgantown—A six-week summer course will be given by the University of West Virginia department of mines to prepare men for mine foremen and fireboss positions. The course will begin June 23 and is intended to prepare miners for examinations for certificated mine positions.

The West Virginia Mining Institute will meet in this city June 24.

Clarksburg—The Consolidation Coal Co. is making its annual inspection of its coal mines in the West Virginia district.

Coal Valley—Local officers of the United Mine Workers have received word that 125 men are on strike in the Coal Valley mine in Boone County.

Wheeling—The plant of the Elm Grove Coal Co. was tied up Apr. 16 when 75 men went on tsrike. The strike is of an entirely local nature, involving the insurance policy of the company, and an early adjustment is expected.

KENTUCKY

Louisville—The Western Kentucky Coal Operators' Association met last week at the Seelbach Hotel in annual convention, for the purpose of electing officers for the ensuing year and attending to other business, mostly of a routine nature. The Association is composed exclusively of the operators of union mines in that section of the State, and representation was consequently confined to that class of the trade.

OHIO

Lisbon—The power plant and buildings of the Duquesne Coal Co., at Newhouse, a mining hamlet three miles east of this town, have been almost totally destroyed by fire.

INDIANA

Indianapolis—The Indiana Railroad Commission has not acted on the notification of some of the roads that they will raise their rate on Indiana coal, May 1, from 50 to 55c. per ton. Operators believe, however, that the higher rate will never prevail.

ILLINOIS

Springfield—It is stated on good authority that shotfirers will not be ousted from their jobs if machine mining is adopted in this section of the state. The machines will merely facilitate the undercutting of the coal, and shotfirers will still be a necessity.

Streator—The Munts Brothers have closed their operation and the 40 men employed there have sought work elsewhere. The mine will not be reopened until it has been disposed of.

MISSOURI

Kahoka—A seam of coal has been discovered on a farm a short distance south of Memphis.

KANSAS

Pittsburg—The Wear Mine No. 21 has been idle for more than three weeks, following a dispute between the miners and operators in regard to the distribution of the entries. Two hundred men have been out of work.

Fort Smith—It is reported that six men were entombed in mine No. 2 of the Western Coal & Mining Co., at Denning. An explosion wrecked the mine and set it afire. Efforts to reach the imprisoned men have met with little success.

FOREIGN NEWS

Brussels, Belgium—Between 300,000 and 400,000 miners employed in the Charleroi district are on strike for the ballot.

Hamborn, Germany—Sixteen miners were overcome by coal gas in a pit known as the "German Emperor", Apr. 16. Fire had broken out in the pit during the night.

Venezuela—Pell & Co. of New York are investigating the coal deposits of Venezuela and are proposing to engage in an extensive exploitation of them. In the same connection an examination of iron deposits in Venezuela and Colombia is being made and plans are under way to utilize the coal and iron in the establishment of an iron industry on the Caribean Sea.

PERSONALS

Judge Mitchell recently appointed Thomas Robinson receiver of the Hiawatha Coal Co., whose mine is located half a mile west of Urichsville. His bond was fixed at $5000.

The appointment was made upon the application of 65 miners, who claim they have not been paid wages earned during February.

Arthur C. Smith, formerly in charge of the office of the Bessemer Coal & Mining Co., is now connected with the St. Louis office of the Egyptian Coal & Mining Co.

Edwin M. Chance has severed his connection with the Philadelphia & Reading Coal & Iron Co., to become consulting chemist to a number of the larger anthracite and bituminous producers, and to enter into a general consulting practice in Wilkes-Barre.

James W. Turner, state superintendent of the Banner mine, which is leased by the State of Alabama from the Pratt Consolidated Coal Co., and operated by state convicts, has resigned his position, effective when his successor is appointed. His resignation has been accepted but his successor has not yet been named.

Governor Major, of Missouri, has appointed George Hill, of Bevier, as state inspector of mines. The office is a new one and pays a salary of $2000 a year and expenses. Mr. Hill has been a practical coal miner all of his life, and the governor in looking for his man wanted a practical miner from one of the largest coal-producing counties in the state.

OBITUARY

Alexander Fulton, aged 83, one of the best known and wealthiest coal operators in the anthracite region, died at Shamokin, Penn., on Apr. 15. During the early days of mining in this region, he was manager for John Jacob Astor, Franklin Delano and J. Langdon & Co. He came to the United States from Scotland in 1848.

TRADE CATALOGS

Wm. B. Scaife & Sons Co., Pittsburgh, Penn. Gasoline Storage Outfits. Welded Gasoline Tanks. 8 pp.; 7½x9¼ in.; ill.

Myers-Whaley Co., Knoxville, Tenn. Shoveling. Machines for Underground and Surface Work. 22 pp., 8x10 in., profusely illustrated. This is of especial interest to coal operators, as it describes machines which shovel the coal from the mine floor and load it into cars. The smallest machine described weighs 3 to 3½ tons, is 38 in. maximum height, consumes about 7½ hp. per minute. This machine will clean a heading or room 17 ft. in width.

CONSTRUCTION NEWS

Hillsboro, Ill.—The Clover Leaf Mining Co. has struck coal at its new air-shaft and it is understood that the work of sinking will soon be completed.

Sartell, Minn.—The Northern Pacific is planning to erect extensive coaling docks at Sartell this summer. It is intended that Sartell will be used as a coal supply depot for all through passenger trains.

Superior, Wis.—The Heyl & Patterson Contracting Co. is starting the erection of a big coal handling bridge on Northwestern dock No. 1. The company has recently completed the Island Creek dock at Duluth.

Henryetta, Okla.—The Pleasant Valley Coal & Coke Co. is sinking its No. 2 shaft north of the old 'Frisco tank on that road, about 5 miles north of town. The shaft will be 8x12 ft., 128 ft. deep, and will be built of concrete for a part of its depth.

Punxsutawney, Penn.—The P. & N. W. has started an extension of its spur that runs from Hilman into the Maderia Hill mines at Clover Run. It will be about two miles long and will tap a field of between five and six thousand acres of good coal.

Leavenworth, Kan.—It is understood that a Kansas syndicate has made an offer for the Brighton coal mine south of this city, 160 acres of land, 1200 acres of coal rights and the railroad from the mine to Lansing. It is the purpose of the syndicate to make a manufacturing center of Brighton. It is not the intention to sell any coal, but to use it for generating electric power.

Milwaukee, Wis.—The Milwaukee Western Fuel Co. and the Philadelphia & Reading Coal & Iron Co. are contemplating increasing the capacity of their docks at a cost of more than $1,000,000. The present capacity of the Milwaukee company is about 125,000 tons annually, while the capacity of the Reading company is 300,000 tons. It is expected that when the new machinery has been installed that the capacity of each will be doubled.

Grand Forks, B. C.—The Kettle Valley Ry. is building a spur to the Midway mines of the Boundary Mining and Exploration Co. As soon as this has been completed the road will use this coal for its locomotives. It is not the intention of the company to try to market any of the product, except that used by the railway, until next fall. A number of pumps, a compressor and a hoist are being installed at the mine.

NEW INCORPORATIONS

Birmingham, Ala.—The Burnwell Coal Mining Co.; capital stock, $50,000. Priestly Toulmin, president.

Birmingham, Ala.—The Wittichen Coal & Transfer Co.; capital stock, $25,000. Carl F. Wittichen, president and general manager.

Marissa, Ill.—The Marissa Coal & Mining Co.; capital stock, $2000. Incorporators: W. H. Hale, J. B. Brown and W. D. Newcom.

Frankfort, Ky.—The capital stock of the Elkhorn and Beaver Valley Ry. Co., of Ashland, has been increased from $30,000 to $130,000.

Little Rock, Ark.—The Quing Anthracite Coal Co.; capital stock, $75,000. J. T. Bullock, of Russelville, is named as agent for the company.

Dallas, Tex.—The Malkoff Lignite Co., capital stock, $19,000; purpose, mining. Incorporators: H. C. Jones, H. C. Maersch and Joseph Samuels.

Rich Hill, Mo.—The Eureka Coal Mining & Mercantile Co., capital stock, $20,000. Incorporators: F. A. Griffen, J. H. Williams and G. H. Davis.

New Straightsville, Ohio—The Calvin Essex Coal Co.; capital stock, $40,000. Incorporators: Calvin Essex, Sumner Cottingham, Fred Essex, L. R. Statler and J. A. Statler.

Chicago, Ill.—The New Enterprise Coal Co.; capital stock, $10,000; mining, treating and preparing coal for the market. Incorporators: F. C. Honnold, L. L. Dent and C. Y. Freeman.

Chicago, Ill.—The William Meusching Coal Co.; capital stock, $10,000; buying selling and dealing in coal, wood, ice, etc. Incorporators: E. A. Kimball, E. M. Kimball and J. E. McDowell.

Santa Fé, N. M.—A charter has been granted to the Superior Coal Co.; capital, $25,000. Incorporators: Mrs. Elizabeth G. Kunz, Charles E. Kunz and Guy L. Rogers ,all of Albuquerque.

Huntington, W. Va.—The Big Ugly Creek Mining Co.; capital stock, $60,000; to mine coal, seek oil, gas, etc. Incorporators: A. J. Stein, G. Neace, G. J. McComas, H. E. Love and Daniel Dawson.

St. Louis, Mo.—The United Coal & Coke Co.; capital stock, $2000; to do wholesale and retail coal and coke buisness. Incorporators: T. F. Nolde, C. E. Miller, L. C. Poon, J. P. Murphy and G. W. Hooper.

Phœnix, Ariz.—A charter was granted to the Mother Lode Gold & Copper Co., to deal in and operate minerals and mineral lands, including coal; capital, $1,000,000. Incorporators: Fred H. Larsen and M. A. Rabbitt, of Phœnix.

Mingo Junction, Ohio—The Brettel Bros. Co.; capital stock, $25,000; mining and dealing in coal and kindred products. Incorporators: Thomas Brettel, Sr., N. M. Brettel, M. Brettel, G. L. Thompson and James Brettel.

Cleveland, Ohio—The Short Creek Coal Co., of Cleveland, Ohio, has been incorporated with a capital stock of $600,000 to mine and deal in coal. Incorporators: J. J. Roby, E. B. Thomas, C. A. Niman, E. G. Hoag and L. T. Smythe.

Columbus, Ohio—The Central Pocahontas Coal Co., of Columbus, Ohio, has been incorporated with a capital stock of $100,000 to mine and deal in coal. Incorporators: J. S. McVey, S. McFadden, J. W. Miller, E. Bragunier and D. N. Postelwaite.

Phœnix, Ariz.—A charter was granted to the Golden Rescue Mining & Mercantile Co., of Phœnix; to deal in and operate mineral lands, including coal; capital, $1,500,000. Incorporators: W. G. Johnson, J. A. Jacoby, C. S. Norman and R. S. Watkins.

Phœnix, Ariz.—A charter has been granted to the Antelope Gold Placer Mining Co.; deal in and operate coal and other mineral lands in addition to gold; capital, $250,000. Incorporators: John L. Uhlik, of Octave, Ariz.; C. C. Castle, of Octave, and C. W. Trasey, of Octave.

INDUSTRIAL NEWS

New Albany, Ind.—The C. H. Menden Coal Co., formerly of Evansville, has moved its headquarters to this city.

Grove, Okla.—A bed of coal about 4 ft. across and 6 in. thick has been discovered on the John Kariho farm, 5 miles north of Grove.

Port Arthur, Tex.—Capt. W. W. Tyrrell has purchased an interest in the South Coast Coal and Fertilizer Co. with headquarters at Sabine.

Pittsburg, Kan.—Frank Pierce & Sons, of Sharpsville, have purchased 160 acres of coal land and are now making arrangements to develop the same.

Pine Bluff, Ark.—The Arkansas & Texas Consolidated Ice & Coal Company has disposed of its ice plant, street railway and light plant at Marshall, Tex.

Ashland, Penn.—The Reading Coal & Iron Co. is soon to make an effort to transplant the borough of Gilberton and more than 500 inhabitants from the present site.

Hazleton, Penn.—Many hands will be given employment when N. J. Cuyle & Co. open the new strippings at Laurel Hill for the Lehigh Valley Coal Co., east of this city.

Williamson, W. Va.—It is stated that a tract of 10,000 acres of coal land on Pond Creek, owned by Col. L. E. Tierney, will soon be leased to several well known operators.

Punxsutawney, Penn.—W. G. Wilkins & Co., Westinghouse building, Pittsburgh, have placed orders for the equipment of the power plant of the Sykesville Coal & Coke Co., Sykesville, Penn.

Pittsburgh, Penn.—J. V. Thompson, of Uniontown, has sold a tract of coal land to the Midland Steel Co. for $1,700,000, netting him a profit of nearly $1,000,000. The average price per acre was $800.

Sunbury, Penn.—A prospector has been seeking continuation of the Lykens Valley field, in lower Northumberland County. During the last year his efforts have been rewarded by striking a 5½-ft. seam.

Piedmont, W. Va.—The Franklin Coal Co., at Westernport, has recently filed a petition for receivership, and W. F. Coale, of Cumberland, has been appointed. The company alleges debts of over $16,000.

Welch, W. Va.—It is understood that the works of the U. S. Coal & Coke Co. on Tug River are again in full operation. They were shut down as a result of the car shortage caused by the recent high waters.

Mahaffey, Penn.—The Maderia Hill Coal Co. has purchased a tract of 5000 acres of coal land in the Clover Run district near this place. Operations are to begin at once and a large tipple has already been contracted for.

Freeport, Ill.—E. J. Thorne has been appointed receiver for the Fairbury Coal Mining Co., following a strike by the employees due to unpaid wages. The miners have returned to work pending the action of the receiver.

Hazard, Ky.—It is reported that several prominent coal operators have been making investigations in that vicinity, either with a view to acquiring properties or for the purpose of looking over lands which they already own.

Obesonia, Penn.—A large bed of coal has been discovered at Rocky Ridge, in the new workings of the Possum Hollow Coal & Coke Co. Special arrangements are being made to get the coal on the market. R. W. Jacobs is general manager.

Bluefield, W. Va.—The Boswell Coal Co. has recently been formed at Richlands. Thos. T. Boswell, of Baltimore, is general manager. The company has leased 23,000 acres of coal land on Coal Creek and will make extensive improvements.

Charleston, W. Va.—A tract of several hundred acres of coal land on Slab Fork near Mullens has been leased by Fayette capitalists form the Powell Lusk heirs. It is rumored that great developments will begin at once. This tract carries the famous Pocahontas No. 3 seam.

Pittsburg, Kan.—Mine No. 11 of the Cherokee & Pittsburg Coal Co., which was shut down a little more than a week ago by State Mine Inspector Francis Keegan, is again in operation. The managers have remedied the defects which caused Mr. Keegan to order the mine to be closed. The mine employs about 300 men.

Morgantown, Ky.—The Butler County Coal Co., recently incorporated, proposes immediately to begin development work on a tract of 800 acres, with a daily output of about 50 tons. The officers of the company are: J. A. Watkins, president; G. L. Drury, vice-president, and C. E. Sullivan, secretary, treasurer and manager.

Johnson City, Ill.—The Lake Creek mine, which has been idle for several years, and was recently taken over by a New York Syndicate, representing the Cotton Belt Ry., has been leased by the Consolidated Coal Co., of St. Louis, who are rapidly developing the property with a view to selling the output for railroad purposes.

McAlister, Okla.—W. E. Beatty, president of the Union Coal Mining Co. has given orders to the superintendent to open the company's mine at Adamson. The mine was closed in February for want of orders. Four hundred men will return to work and a long run is in prospect. This is one of the largest mines in the McAlister district.

Pittsburgh, Penn.—A special meeting of the stockholders of the Westmoreland Coal Co. has been called for June 16 for the purpose of voting on the proposition to increase the capital stock of the company by $1,000,000. The proceeds of the issue will be used to purchase new coal lands. This move would bring the capital up to $6,000,000.

Columbus, Ohio—Coal men in Columbus have received word that insurance on lake vessels is now in force and a good lake movement is expected from this time on. A number of vessels had been loaded before the formal opening of navigation and these moved as soon as word was received from the upper lake regions that the ice was melted.

Buffalo, N. Y.—The Noble-Williams Coal Co. has bought the property of the Outlook Coal Co., of Lackawanna County, Penn., consisting of 790 acres of partly developed anthracite land. The company proposes to mine about 300 tons of coal a day. It is controlledd by the Frank William & Co., which operates three bituminous mines in the Allegheny Valley.

Scranton, Penn.—T. P. Lewis, of Throop, has struck a 5-ft. vein of coal on a tract lying between Marshwood and the Mossic Mountain, and expects to open up one of the richest coal fields that has been discovered in this region in years. Mr. Lewis, who is foreman for the Pancoast company, owns 438 acres in that vicinity. The first seam was struck at a depth of 110 ft.

Johnstown, Penn.—The new drift at Rummel has recently sent out its first shipment of coal. The original Rummel drift was exhausted not long ago. Shortly before this, however, work was commenced on a trestle from the old hill mine to another hill across the valley. Coal is now brought from the new mine over the trestle and through the old drift to the tipple.

Pottsville, Penn.—An outcrop of virgin coal has been discovered on the property of S. A. Hogan by workmen who were excavating for a cellar. The seam measures 15 ft. in thickness and is of good quality. It will, however, be impossible to work the coal for market purposes, owing to the fact that it lies so close to the surface and in the residential section of the city.

McKeesport, Penn.—It is reported that the upper or Sewickley seam of coal, which is located 80 ft. above the Pittsburgh seam, has been discovered and opened up in North Versailles Township. This coal covers an area of several hundred acres and is easily accessible because of improved roads. It is said that the G. M. Cypher Co. is contemplating opening up this new field and operating it on an extensive scale.

Beaver Dam, Wis.—It is reported that a large coke plant is soon to locate at Mayville. The new plant will furnish employment for about 600 men most of whom will live in houses erected by the company. It is said that several furnaces will be built near the ore mines and that the gas obtained in the coke manufacture will be utilized in smelting the ore. The Mayville Coke & Gas Co. is behind the venture.

Springfield, Ohio—The Ohio Southern R.R., from Lima to Wellston, was sold recently to Henry J. Schumacher and Daniel I. Murray, representing the Central Trust Co., of New York, first-mortgage bond holders, at the upset price of $1,550,000.

The sale of the D. T. & I. from Lima north and from Wellston to Ironton was postponed to June 24, in view of the fact that there were no bids presented.

Winchester, Ky.—The Broadhead-Garrett Co. recently closed a deal for 3000 acres of Perry County coal and timber land. The tract is one of the largest undeveloped pieces of land in that part of the state, and has been sought by many investors and working companies. The consideration is said to have been in the neighborhood of $500,000. Green Garrett, of Winchester, a member of the Kentucky Railroad Commission, is president of the purchasing company.

Belleville, Ill.—Mine No, 2 of the St. Louis & O'Fallon Coal Co., at Nigger Hollow, claims the state record for the output of coal. One day recently the output of this mine was 4112 tons in six hours and fifty minutes, or 600 tons per hour. The previous state record was 4500 tons for eight and one-half hours, or 529 tons per hour. This mine uses the H. & H. automatic self-dumping cages, manufactured by the Heryler & Henniger Machine Works, Belleville, Ill.

Columbus, Ohio—The rumor that the Jeffrey Manufacturing Co., of Columbus, Ohio, is contemplating consolidation with another large concern in its line of manufacture and the removal of the larger part of the plant from Columbus has been emphatically denied recently by R. H. Jeffrey, vice-president of the concern. He says the plant will continue to operate in Columbus and, except for a slight modification of the system of the plant, there has been no particular change in the policy of the company.

DuQuoin, Ill.—The Central Illinois Utilities Co., a subsidiary of the Commonwealth Co. of Chicago, has taken over a large number of lighting plants in the Southern Illinois coal field. It is understood that it is the intention to operate them in connection with a new gas company which will have a monster plant at Marion. The gas will be made from Carterville coal with a purifier, and will be pumped to surrounding towns to the extent of 30 miles. The proposed plant will produce a big tonnage of domestic coke.

Welch, W. Va.—It is understood that the Berwind-White Coal Co. has made an offer to purchase the property and holdings of the Jed Coal & Coke Co. at a consideration of $300,000. This property has been in the hands of a receiver for the last year. The property consists of a shaft mine of Pocahontas No. 3 coal and is a part of a lease from the Pocahontas Coal & Coke Co. and the Bouvier-Iaeger Coal Land Co. The mines are adjacent to the U. S. Coal & Coke Co. The Berwind-White people expect to spend in the neighborhood of $200,000 on improvements.

Fort Smith, Ark.—A $2,000,000 deal has been consummated here whereby every mine in the Spadra field, with the exception of the Pennsylvania Mining Co., has become the property of a party of New York capitalists who are said to be closely allied with some of the railroads that traverse the Spadra field. Thirty-two mines are involved, together with 1800 miners. The purpose of the consolidation, it is understood, is to overcome the winter car shortage. Immense storage yards will be built in St. Louis, Kansas City, Little Rock and other points for summer shipments, leaving the cars available in the winter time for the scattered country trade. This will permit the operation of the mines in the summer months, which has never been done with any success in the past.

St. Louis, Mo.—All the property of the Southern Coal & Mining Co., in St. Louis and Illinois, including its several mines on the Southern Ry., has been acquired by the Southern Coal, Coke & Mining Co., with practically the same officers of the company holding these properties previously. The new company is a reorganization of the old company.

In a suit against the Watson Coal Co., of Herrin, Ill., for $29,000, for alleged damages, etc., the Mississippi Valley Fuel Co., of St. Louis, endeavored to tie up $29,000 worth of property of the Devoy & Kuhn Coal Co., claiming that Devoy & Kuhn were indebted for a large amount to the Watson Coal Co. for coal shipped under a contract.

In connection with this, the Watson Coal Co., in March, was given a judgment in the U. S. Supreme Court of about $14,000 against the Mississippi Valley Fuel Co., in a breach of contract suit.

COAL TRADE REVIEWS

GENERAL REVIEW

While the hard-coal dealers are fairly busy, they are not by any means as crowded as is usually the case at this time; as a rule they are having no difficulty in filling all requisitions, although there is coal going into storage. The situation in the wholesale trade is somewhat stronger and the originating companies as a rule are declining to commit themselves for any further deliveries at April prices; indications are that May will also be nearly as active in this department as April has been. It is becoming evident that the individuals are not cutting prices to the extent that was anticipated; this may be accounted for, however, by the fact that many of them have sold their entire summer production at the April circular.

The West Virginia labor trouble still continues to be the controlling feature in the Eastern Bituminous market. It is evident that there is a great deal of determination on both sides of the controversy, and the probabilities are that Pocahontas and New River shipments will be very materially restricted before long. The movement now is almost entirely on contracts, but as consumers are showing a disposition to take their full allotment it is evident that there is a good strong and consistent consumption. Prices in the New England markets still rule about 15c. above last year's level, but business is slow to close at these figures; consumers do not feel that the advance is justified and think that concessions will be offered later.

The Pittsburgh market developed a great deal of strength during the week due probably to a large unsatisfied demand for Lake coal. There is some shortage of railroad equipments particularly of certain descriptions, but operations are now up to about 75 per cent. capacity; local producers are watching the West Virginia labor difficulty with keen interst as a restriction of the production there will undoubtedly be reflected upon the Pittsburgh market. Conditions in this vicinity are evidently becoming steadily better in spite of the effort on the part of the consumers to depress the market; consumption is so enormous that it is taxing the capacity of the railroads, and it is tentatively conceded that the operators are in controll of the market.

It is now evident that it will be several weeks and possibly months before the movement in Ohio will again be entirely normal. There is still considerable congestion at junction points, but embargoes are being lifted in every direction, and production has probably reached 75 per cent. normal. The tidewater demand out of Hampton Road is light, but coastwise shipments are heavy, and have materially reduced the accumulated supplies; dumping at the piers has been good, and prices firm. In the Southern markets the steam coals are maintaining an unusually strong position hardly to be expected at this period of the year.

In the flood zone in the Middle West railroad yards and terminals are jammed with all kinds of freight, and the roads are making slow headway in the work of restoring conditions. The first shipments for more than three weeks over the Norfork & Western and Chesapeake & Ohio into Chicago, arrived last week. Coal at this latter point continues selling at the circular, but there is evidently a large unsatisfied demand. Screenings are somewhat stronger due to the meager production of domestic grades; prices are quite unstable and fluctuating over a large range.

BOSTON, MASS.

Bituminous—The mine workers' union is apparently confining its efforts to the New River field and is letting other districts alone for the present. A good sized sum of money is reported available for purposes of organization and for supplying necessaries to those who join and are thereby out of employment. There appears to be a good deal of determination on both sides and it is now expected that work at the New River operations will be under severe curtailment from lack of men.

It is too early yet, to say what would be the effect of a general strike in West Virginia on the market; the other fields are capable of a much increased output and unless the troubles in New River develope to serious proportions it may be that the results will be negligible, so far as prices are concerned. Buyers seem not to be disturbed over the outlook, and there is almost no change from a week ago. Sales of Pocahontas and New River are scattering, for the most part, and few contracts are being placed. There are many large orders in New England yet to be closed but purchasers feel that there will be concessions later and that conditions do not warrant higher prices than in 1912.

There has been an awakening of interest in the better grades from Pennsylvania. The differential with Pocahontas and New River is larger than usual and several buyers are experimenting with them in the hope of replacing some of the coal ordinarily taken from West Virginia, via Hampton Roads. Many have already found that certain of the coals from Cambria, Somerset and Clearfield, can be used with excellent results and from now on there is likely to be a better demand for these grades. The movement is good; the dullness early in the month has given way to a fairly strong demand, although prices remain where they were put, in order to induce April shipments.

Water Freights—Barges and large schooners are chartering at 75 to 80c., Hampton Roads to Boston, and while there is a regular demand there is no snap to the business. Steamers that ordinarily load New River, in one or two instances, have lately been diverted into Baltimore to load Georges Creek. On Long Island Sound 40c. to 45c. is the ruling rate from New York.

Anthracite—The cold weather has given an impetus to the retail demand and in some cases the originating companies are declining to commit themselves to the April price on boats entered between now and the end of the month. Broken, stove and pea are in relatively short supply and it looks as if May would prove to be almost as active in anthracite as the month just closing. The bulk of the hard-coal receipts continue to be from Philadelphia.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1.00@1.35
Clearfields, f.o.b. Philadelphia	2.25@2.60
Clearfields, f.o.b. New York	2.55@2.90
Cambrias, Somersets, f.o.b. mines	1.25@1.45
Cambrias, Somersets, f.o.b. Philadelphia	2.50@2.70
Cambrias, Somersets, f.o.b. New York	2.80@3.00
Georges Creeks, f.o.b. mine	1.67@1.77
Georges Creeks, f.o.b. Baltimore	2.85@2.95
Pocahontas, New River, f.o.b. Hampton Roads	2.75@2.85
Pocahontas, New River, on cars Boston	3.68@3.90
Pocahontas, New River, on cars Providence	3.58@3.80

NEW YORK

Bituminous—There is some very cheap soft coal being offered in the local spot market, but the volume moving is so small that these low quotations are not of great moment. There is very little demand for prompt coal, but owing to the restrictive measures of the operators there is an equally reduced supply available. Operators are showing every determination to obtain a stable and profitable figure for their product, and in some cases are restricting production entirely to contract requirements . The contracts in the local markets are now all pretty well closed up and this feature of the business has ceased to attract any further interest.

The car supply has been gradually tightening for some time, and was a trifle worse during last week. However, since the mines are not atempting to run full capacity the supply has so far been fully up to requirements. The shortage is ascribed to the large amount of equipment tied up in the flood zone, and it was stated by one company that the distribution for one day last week was only 10 per cent. the requirements. We continue last week's quotations, although there is some coal being offered at less, on the following basis: West Virginia steam, $2.55@2.60; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—The hard-coal market has developed no new features during the week. The companies have all the orders they can possibly take care of and it is clear they will not be able to fill all the requisitions for April tonnages They are endeavoring to make as equitable a distribution of the production as possible. The demand is generally insistant on all grades, but is the most urgent on stove and rice, particularly the former.

Production at the mines is heavy, there being few interruptions to work, due to labor troubles or car supply, although there has been some slight delays occasioned by the latter. Toward the end of the week an occasional shortage develops

in the supply of open cars, but the railroads invariably catch up again over the week end so that the shortage has at no time been serious.

The local market is not quotably changed and we continue last week's prices as follows:

	Circular	Individual	
		Lehigh	Scranton
Broken	$4.50	$4.45	$4.50
Egg	4.75	4.70	4.75
Stove	4.75	4.70	4.75
Chestnut	5.00	4.95	5.00
Pea	3.50	3.35@3.45	3.50
Buckwheat	2.75	2.25@2.45	2.50@2.75
Rice	2.25	1.95@2.05	2.25@2.35
Barley	1.75	1.50@1.70	1.60@1.75

PHILADELPHIA, PENN.

There is practically little or no change in the anthracite coal trade in this vicinity. All the dealers seem to be fairly busy, although they report business is not what it should be. Most of them like to have their books crowded with orders, but now they claim they are having little or no difficulty in keeping up with those they are receiving. The demand for egg does not seem to be as brisk as would be desired, although this by no means indicates a general condition; requisitions from other points are absorbing all that is mined. The operations at the mines are still continuing at full time, with little troubles here and there on account of strikes. One of the largest companies had all of its mines tied up for some time, owing to the so called "button" decoration, which the mine workers seem to feel all the men should wear. These troubles, however, seem to be quickly adjusted now. Compared with 1911, which is the only comparison that can be made, inasmuch as the suspension was on at this time last year, all operating companies report that their tonnage is at least on a parity, but they do not look for any records to be broken.

Strange to say, notwithstanding the marked lack of snap to the trade, there does not seem to be as much cutting of prices by the individual operators as has been the case in former years. This has been commented on to some extent, but the explanation may be in the fact, that many of them have closed for almost their entire summer output, at the April circular. One very large operator claims that his tonnage for the next five months has, been disposed of, although not indicating at what price such disposition had been made. Taking into consideration the fact that possibly these arrangements are being made, this may possibly explain the lack of cutting at the present time, the trade being perfectly willing to pay the present prices, if assured of obtaining them over such a long period.

The bituminous market is not distinguishing itself by any marked activity. There are consumers enough, but it is difficult to sell them, and they are driving hard bargains. Good grades of coal are holding fairly to quotations, but the medium and fair grades are going begging, in some instances. Contracts are still being held up, and the current movement at the present time is rather to the individual than the contract buyers.

PITTSBURGH, PENN.

Bituminous—The market is very strong. It is claimed that some producers have in the past week secured $1.50 for ¾-in. coal in the lake trade. A heavy business was done after the announcement of season prices, at $1.40 for ¾-in. coal, but it is understood some producers held off from contracting, expecting to do still better. There remains considerable unsatisfied demand in the Lake trade. Mine operations are the best yet this season and represent better than 75 per cent. of full capacity. Car shortage is heard of in some quarters, and flat bottom gondolas are being used in trade which much prefers hopper cars. It is claimed the railroads have not sufficient hopper cars, and some of the operators have been trying lately to make an issue with one of the leading roads, furnishing it coal for its own use in flat bottom cars when the road much prefers the hopper bottoms. Contrary to reports sent out last week from the scene of the trouble, the West Virginia labor difficulties are not settled and some operators in the Pittsburgh district expect production in that state to be curtailed all summer. The market is firm at regular prices, as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The market is showing surprising stiffness. While a little coke backed up in the region on account of transportation difficulties growing out of the floods, it seems difficult to find enough coke to resume normal shipments. Trustworthy figures of shipments week before last showed less than 400,000 tons, whereas requirements of blast furnaces involve 425,000 tons at the very least, and it is doubtful whether full shipments were made even last week. There is very little demand for prompt coke, but the market seems strong at $2.25, with very few sellers. As to second-half contracts, there is nothing but opinion, there being no active negotiation, but the operators all insist that nothing can be done under $2.50. Foundry coke remains quotable at $3@3.50 for prompt or contract, these figures referring to standard brands of 72-hr. foundry.

BALTIMORE, MD.

The movement in the local market during the past week was confined almost entirely to contracts, especially in the tidewater business. As compared with last week, there was considerably more contract coal handled over the local piers, and this willingness of the consumers to take their full allotment, has caused a more cheerful feeling in the trade. While operators have been generally optimistic, there has not, as a rule, been anything tangible upon which to base such a feeling, but the increased business during the past week makes them now feel that the dull corner in the trade has been definitely rounded. More contracts have also been renewed at the customary advance.

The small demand in the spot market is ascribed to the heavy stocking early in March, when a protracted cold spell was anticipated. The low grades are quoted in the prompt market as 70 to 80 cents; slack is active, due to a rather sharp demand from cement works in Maryland. The labor situation in the West Virginia field is causing a slight feeling of uncertainty in the local trade. A number of the coke oven plants in the state have been shut down, and will not resume until there is more life in the coke market.

BUFFALO, N. Y.

The bituminous market is quite strong and appears to be gaining in steadiness from week to week in spite of the efforts of the consumers to depress it. The amount of unsold coal is not as large as it was and there would be none at all if everybody believed in the future soundness of business. The consumption is enormous, fairly taxing the railroads to handle it. The outlook is for a continuation of these conditions for an indefinite period.

All effects of the late floods have about disappeared from this section and the railroads running into Ohio are taking care of their business about as usual. The opening of the Lakes has improved the bituminous market, for it was found that there was not tonnage enough to handle the coal stored at various points. Something like the same conditions prevailed in anthracite for the Lake trade; shippers are complaining that when they can get tonnage they are often without coal.

Reports from all points in this bituminous sales-district agree that the demand is very strong. Shippers with a good organization and good coal behind them claim that they are selling a large output at paying prices and the outlook is very much better than it was a year ago. There is a good volume moving under contract and contracting is not concluded yet, but the consumer by no means controls the market, as he has done for so many seasons past. At the same time there is no great profit to anyone.

The Lake season opened here on Apr. 12 by the sailing of one steamer light, for a coal cargo at Toledo She was followed on Apr. 16 by 31 other steamers, mostly coal laden. The upper Lake ports are not open and they may all have to wait. Lake clearances to date include 280,000 tons.

It looked early in the month as if the bituminous market was going to break, so many people were offering coal at cut prices, but Pittsburgh and the largest concerns in the Allegheny Valley held firm and now the others are following suit. Quotations are fairly strong at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.25 for mine-run and $2.15 for slack, with Allegheny Valley and Reynoldsville about 25c. less. Coke is stronger on the basis of $5 for best Connellsville foundry. Smithing and other special coals are active, but they seldom vary in price.

COLUMBUS, OHIO

The trade in Ohio shows signs of becoming normal again, since the disastrous floods. Railroads are gradually getting in shape and embargoes are being removed in every direction. There is still considerable congestion at junction points and it will require several weeks and possibly months for traffic to become normal again.

There is a good demand for practically every grade of coal from the Ohio fields. While the domestic demand is gradually running out, still orders are coming in from unexpected sources. The recent flood caused a rush of small domestic orders and all the broken natural gas mains are not yet repaired.

Steam business continues good and in a larger volume as plants are gradually resuming operation again. Prices for steam grades are strong and inclined to advance all along the line. The prospects for the future are believed to be good and producers think that steam business will rule

strong for the coming few months at least. There is also a better demand for railroad fuel as the freight movement increases. Sales managers of many of the Ohio companies are turning their attention to railroad fuel contracts which will be awarded in a short time. Some steam contracts are expiring at this time and prices generally are higher than last year.

Lake trade is also receiving its share of attention. Since insurance on lake vessels is in force, there is much activity in that direction. Movement of cargoes has started and within a short time a large tonnage will be on the way to the Northwest. In fact it is expected that the Lake movement will tax the capacity of the coal carrying roads in the Ohio fields. The demand for tonnage from the Northwest is strong and the season is expected to be a prosperous one.

Production is gradually getting larger. In the Hocking Valley the output during the past week has been about 75 per cent. normal and the same is true of Eastern Ohio. In the Pomeroy Band, where a number of mines were flooded, the production is about 60 per cent. of the average.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	.....	$1.50	$1.50
¾-inch	1.35	$1.30	1.35	1.30
Nut	1.25	.....	1.25	....
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	1.00	.....	1.00	1.00
Coarse slack	0.85	0.90	0.90	0.85

LOUISVILLE, KY.

A continued spell of pleasant weather has reduced the demand for domestic grades and caused a corresponding shortage of screenings, but the steam consumption continues strong. The flood damage to the railroads seems to have been more general than was at first supposed. They are experiencing a great deal of trouble in restoring order and there is still a heavy congestion at the terminal. Belt lines are finding it difficult to move freight owing to the crowded condition of the yards and in some cases to the lack of adequate motive power. While all the roads are now handling traffic, the roadbeds, trestles and bridges are so unsafe that the train movement is considerably handicapped.

However, about the only inconvenience that is being experienced by the consumers is due to the shortage of screenings. Preferences as to quality on screenings are being disregarded because of the shortage; the Western Kentucky variety which usually sells 10 to 20c. off the Eastern Kentucky grade now readily brings 90c. and even higher, while Straight Creek and like qualities sell up to as high as $1.10 f.o.b. mines. Mine-run is rather heavy, operators being glad to obtain $1.25 to $1.35 for Eastern Kentucky grades.

HAMPTON ROADS, VA.

While there has been no heavy demand for coal at tidewater during the past week there have been some large shipments on Coastwise contracts which has considerably decreased the accumulated coal. Prices have remained firm, $2.85 being asked for spot coal. There have been some small shipments of high-volatile coals but there is little demand for this grade. The outlook is that prices will continue firm although the unrest in the New River-Pocahontas fields may have some effect on the market.

Dumpings at the three ports have been good, during the latter part of the week; a large tonnage was handled over the Sewalls Point Piers and it is expected that April dumpings there will run considerably over the March tonnage. It is rumored that one of the large shippers over these piers has acquired land at that point for the erection of a large and modern plant for the storage of steam coal; also that the contract has been let and that work on the plant will be commenced shortly.

Bids have been asked for on Government transport coal but operators have not responded on account of several of the requirements in the contract.

INDIANAPOLIS

Practically all parts of the state can again be reached with coal, although some in a roundabout way. Railroad conditions are far from normal, however, and it will be a month or two yet before that status will be reached. Shipments are still slow on all roads and a week to ten days must be allowed for the usual two to three days movement. Railroad yards at terminal and connecting points are jammed with all kinds of freight, including coal.

Under these conditions operators are not busy. With spring weather prevailing, the consumption of domestic coal has practically ended and the warm sun has cut down the needs of steam users, though, otherwise, the latter trade is about normal for the season. The floods left many of them with matters more pressing to attend to.

Not a car of Eastern coal has come to Indianapolis since the flood, Mar. 25. It is said the C. & O. has 6500 cars in Kentucky and West Virginia, ready to move through Cincinnati but held back because connecting lines in that city have been unable to accept shipments. Temporary bridges are being erected over the rivers in Indiana. The Big Four is only now getting into Chicago over its own lines. Coal prices are at summer level and run about as follows, f.o.b. mines:

No. 4 mine run	$1.10	3-inch domestic lump	$1.45
No. 5 and 6 mine run	1.05	4 and 5-inch	1.55
1¼-in. steam lump	1.30	4 screenings	1.00
Nut	1.25	5 and 6 screenings	0.90
Egg	1.35	Brazil block	2.05

The f.o.b. price, Indianapolis, is 50c. higher than the above figures.

BIRMINGHAM, ALA.

The season of the year is here when the steam-coal market suffers most, but a thorough canvass of the various sales offices finds present business and the outlook better than for the past several years at this season. There is of course price cutting on the cheaper steam coals which do not find a ready market except during the period of the year when business is most active. A number of the local producers report heavy bookings of domestic orders, on which shipment is to begin at once, and continue through the entire winter season.

We give below prices of Corona coal for the ensuing season. Corona is one of the Standard coals with the domestic trade.

Month	Fancy Lump
April	$1.80
May	1.85
June	1.90
July	1.95
August	2.00
September	2.15
October to February, inc.	2.25

DETROIT, MICH.

Bituminous—The steam trade at this point is entirely featureless, and as quiet as it has been at any time during the last year. Spot business is confined entirely to small orders for filling out requirements until the new contracts go into effect. The larger buyers who failed to close up early in the season are still holding off, and no important business has been reported during the week.

The prevailing market is about as follows:

	W.Va. Splint	Gas	Hocking	Cambridge	No. 8	Pocahontas	Jackson Hill
Domestic lump	$1.50	....	....	....	....	$2.25	Open
Egg	1.50	....	....	....	....	2.25	Open
1¼-in. lump	1.30	....	....	....	....	....	....
¾-in. lump	1.15	$1.15	1.20	$1.20	$1.20	....	....
Mine-run	0.10	1.10	1.15	1.15	1.15	1.50	....
Slack	0.90	0.90	0.90	0.90	0.90	1.25	....

Anthracite—There is a light demand for hard coal, and the independent shippers are unable to dispose of much tonnage, with the result that they are cutting the circular prices freely. Egg and stove have been quoted down to $3.20, f.o.b. mines, with chestnut 25c. higher.

Coke—Ovens seem to be working up to a good capacity, but the demand for coke is far from strong. Connellsville is quoted at $2.75.

CHICAGO

Chicago coal dealers were agreeably surprised this week when shipments of coal via the Norfolk & Western and the Chesapeake & Ohio R.R. were received. These shipments included smokeless mine-run and they had been in transit for nearly three weeks. What little coal there is in Chicago is selling at circular prices. According to dealers, the market will absorb a large amount of coal as soon as shipments are heavier.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$2.07	$2.40	$2.27	
Egg		2.40		$3.95
Steam lump	$1.82@1.87		2.17	
Mine-run	1.82@1.87	2.20@2.30	1.97	3.30
Screenings	1.62	1.95@2.00	1.62	

Coke—Connellsville and Wise County, $6@6.25; byproduct, egg, stove and nut, $4.45@4.75; gas house, $4.65@4.75.

ST. LOUIS, MO.

Screenings have been about the only coal on which there has been a change in price during the past week; Carterville screenings have gone as high $1, but the market is unsteady and they are liable to fall off to 80c. one day and be back to 95c. the next. Standard screenings are selling anywhere from 75c. to 80 and 85c., with a steady demand that is hard to supply, for the reason that there is no call for the screened domestic coal.

Carterville fell off to its lowest point during the past week, when it was offered for 95c. at the mines, for lump and egg. It is being quoted to large consumers at from $1 to $1.05, and mine-run as low as 95c. An order for 125 cars, lump, egg and nut, for immediate shipment, received quotations on all sizes at from 97½c. to $1.15.

The anthracite price cutting war still continues; one company is now selling to the retail trade at 25c. under the price that the first company made, when they announced a cut. If these people are paying the circular price they are delivering the coal without compensation for delivery. Even at that it is hard to move anthracite, on account of the poor preparation that a large tonnage has shown in this season's shipments.

There is no demand at all for smokeless, and likewise coke. The prevailing market is as follows:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.90
3-in. lump	.....	.....	$1.20	.....
6-in. lump	$1.15 @ 1.20	.....	1.25	1.05
Lump and egg	.....	$2.25	.....	.....
No. 1 nut	1.05 @ 1.15	.....	.....	.....
Screenings	0.90 @ 0.95	.....	.....	0.85
Mine-run	1.00 @ 1.10	.....	.....	0.80
No. 1 washed nut	1.35	.....	.....	.....
No. 2 washed nut	1.35	.....	.....	.....
No. 3 washed nut	1.35	.....	.....	.....
No. 4 washed nut	1.35	.....	.....	.....
No. 5 washed nut	1.10	.....	.....	.....

MINNEAPOLIS—ST. PAUL

The trade in the Twin Cities and the Northwest is without any particular interest at this time. April so far has been very dull and were it not for the fact that the contract period is here business would be extremely slow. While some industrial plants are very reluctant about tieing up on contracts at this time, coal men generally predict a good summer in steam business. There is considerable spot coal to be had which is given as a reason for the holding off of some plants in signing up contracts. Wholesalers appreciate the fact that labor troubles in some fields are liable to develope and are making allowances for same in case of writing contracts over a years time.

OGDEN, UTAH

It has been customary at this time, for a number of years, for the Union Pacific, and Oregon Short Line Railroads to announce a reduction of 25c. per ton in the freight rate on lump and nut coal to take effect either May 1 or June 1 and continue for 90 days. This automatically establishes what is known as a storage period and the mine operators have coöperated with the railroad by announcing a reduction on coal for shipment during this time; this reduction, varies from 25c. to 50c. and in connection with the 25c. in freight rate makes a difference of from 50c. to 75c. to the dealer. As a change in tariff must be published thirty days before it becomes effective, it is evident that the storage period will not commence on May 1 this year, as no notices have so far been received.

PRODUCTION AND TRANSPORTATION STATISTICS

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for February, 1912-13, and for the eight months ending February, 1911-12-13, in long tons:

	8 Months			February	
Imports from:	1911	1912	1913	1912	1913
United Kingdom	12,005	5,861	7,355	217	137
Canada	1,115,655	625,238	954,363	111,669	110,401
Japan	6,313	7,307	42,217	250	12,213
Australia & Tasmania	206,765	149,396	107,017	6,256	8,709
Other countries	4,709	1,444	3,257	529	2,809
Total	1,345,447	789,246	1,114,209	118,921	134,269
Exports:					
Anthracite	1,911,812	2,301,177	3,224,604	231,684	361,493
Bituminous,					
Canada	5,586,404	7,475,621	7,559,065	396,004	556,190
Panama	348,342	303,019	307,759	52,746	38,000
Mexico	438,853	211,374	206,908	26,072	51,692
Cuba	602,474	712,451	805,162	74,419	98,386
West Indies	346,823	442,694	402,705	67,074	73,269
Other countries	391,471	519,057	642,367	79,340	79,253
Total	7,714,367	9,664,216	9,923,966	695,655	896,790
Bunker coal	4,189,020	4,453,131	4,794,912	530,272	564,222

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for March, and first three months of this year and last year in short tons:

	March		Three Months	
	1913	1912	1913	1912
Anthracite	741,209	1,140,976	2,743,504	3,288,737
Bituminous	4,050,247	4,501,653	12,117,747	12,169,935
Coke	1,247,451	1,147,602	3,756,325	3,111,786
	6,038,907	6,780,231	18,617,576	18,570,458

FOREIGN MARKETS

GREAT BRITAIN

Apr. 11.—Strong conditions rule in all branches of the steam-coal trade, but new business for early shipments is considerably restricted owing to the heavy commitments already undertaken by the various collieries. For forward loading the inquiry is good.

The possibility of "nonunionist" strikes on a large scale at the end of this month is causing some anxiety.

Quotations are approximately as follows:

Best Welsh steam	$5.04	Best Monmouthshires	$4.50@4.60
Best seconds	4.80@4.92	Seconds	4.32
Seconds	4.56@4.80	Best Cardiff smalls	3.88
Best dry coals	4.56@4.80	Seconds	3.64

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

British Exports—The following is a comparative statement of British exports for March, and the first three months of the last three years, in long tons:

	March		3 Months		
	1911	1913	1911	1912	1913
Anthracite	110,805	216,151	597,551	558,004	701,516
Steam	1,104,644	4,144,761	11,054,747	9,046,223	12,609,068
Gas	208,527	833,547	2,442,009	1,938,998	2,610,246
Household	34,331	141,867	368,444	299,234	435,454
Other sorts	78,606	262,448	738,601	630,613	882,725
Total	1,536,913	5,598,774	15,201,352	12,473,072	17,239,009
Coke	55,083	76,340	251,671	277,123	282,190
Manufactured fuel	63,149	156,210	425,246	373,332	507,202
Grand total	1,655,145	5,831,324	15,878,269	13,123,527	18,028,401

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 19:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	34	33	33	41¼	31
Colorado Fuel & Iron Pref	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Island Creek Coal Pref	225	210	215	....	....
Pittsburgh Coal	20	20	20	24¾	19
Pittsburgh Coal Pref	83	83	83	95	80¾
Pond Creek	23¾	22	23¼	28¼	22
Reading	166¾	163¾	165¼	168¾	152¼
Reading 1st Pref	92	90	91	92¼	89¾
Reading 2nd Pref	92¼	92¼	92¼	95	87¾
Virginia Iron, Coal & Coke	50	50	50	54	44¾

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Yea.'s Range	
Colo. F. & I. gen. s.f.g. 5s	96	98¼	97¼	97¼	97¼	99¼
Colo. F. & I. gen. 6s	..	..	107¼	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	81	Sale	81	81	78¼	85
Cons. Ind. Coal Me. 1st 5s	75	80	85	June '12	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102¾	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	..	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	..	87¾	87¾	Mar. '13	87¼	87¾
St. L. Rky. Mt. & Pac. 1st 5s	78	81	57	Mar. '13	76	80
Tenn. Coal gen. 5s	101¼	102¼	101¼	102¼	100¼	103
Birm. Div. 1st consol. 6s	101¼	103¾	101	April '13	101	103
Tenn. Div. 1st g 6s	..	103¾	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	101¼	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s	..	..	..	..	..	..
Victor Fuel 1st s f 5s	80	83½	79¾	Feb. '13	79¾	79
Va. I. Coal & Coke 1st g 5s	95	Sale	95	95	94¼	98¾

DIVIDENDS

Reading Co.—First Preferred—Regular quarterly of 1%, payable June 12 to holders of record May 27.

New Central Coal Co.—Dividend of 2%, payable May 1 to holders of record Apr. 28.

INDEX OF COAL LITERATURE

We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order.

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